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Original Research Article

Effect of lockdown on routine immunization services in a tertiary care hospital of Rajasthan, India: quarterly analysis

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ABSTRACT

Background: Lockdown was used as a tool to control COVID-19 but it has resulted in the disruption of routine immunization services both in India and globally. Present study aimed to estimate the effect of COVID-19 lockdown periods during years 2020 and 2021 on routine immunization at tertiary-care hospital in Jaipur, Rajasthan, India.
Methods: A retrospective record-based observational study was conducted at paediatric tertiary-care hospital, Jaipur. Data were collected from the immunization records of the centre for the vaccines administered to children (0-16 years) under the universal immunization programme (UIP) from January 2019 to December 2021. Doses administered were assessed as a proxy measure of vaccine coverage. The vaccination trends were compared with base year 2019. unpaired 't' test of significance and percent change were used for statistical analysis.
Results: The effect of lockdown was maximum in the second quarter of both years 2020 and 2021 with the declination of the total vaccine doses administered by -49.9% and -36.2% respectively. The first lockdown period in year 2020 recorded maximum negative difference in dose of Td (10 years) (-98.4%) followed by DPT booster-2 (-83.6%). The second lockdown in year 2021 recorded maximum negative difference in dose of Td (16 years) (-62.5%) followed by Td-10 years (-58.1%) and DPT booster-2 (-56.5%).
Conclusions: This study concludes that the least vaccine doses were administered in second quarter of both years which coincides with lockdown period. Hence during emergencies like lockdown other alternative arrangement for continuance of routine immunization may be implemented.

Keywords: Lockdown, Routine immunization, COVID-19, Paediatrics, Tertiary-care

INTRODUCTION

The COVID-19 pandemic had been unparalleled in its magnitude and impact resulting in crisis not seen since the global influenza pandemic of 1918-1919.[1] In the mask of uncertainty presented by the emergence of a novel virus, the governments worldwide were forced to apply a complete lockdown especially after WHO declared it a pandemic on 11th March 2020.[2] Measures such as regional or country-wide lockdowns, travel restrictions, and social distancing were implemented to combat the spread of the novel coronavirus.[1] Every countries lockdown was different with varying levels of stringency.[3] Many policy decisions taken by governments during the COVID-19 pandemic resulted in disruption in services of all sectors. In the healthcare sector, only essential and emergency services were allowed during the lockdown periods. The second wave of the pandemic in year 2021 was more severe than the first one in India.[4] The health system was burdened with sudden upsurge of cases, reduced supplies of essential treatments, and increased deaths particularly in the young population.[4] Second lockdown had to be implemented to control the situation and prevent further burden on the already over-burdened health system. This resulted in disruption of the routine immunization services in India. The lockdown in India also impacted the immunization services globally. India is responsible for 1.25 billion requirements of doses

out of 2.4 billion doses of vaccines required by UNICEF, i.e., nearly half of the requirement.[5] Hence, the lockdown is responsible for impacting key manufacturers of vaccines like India and also prevented other countries from receiving the vaccines due to import restrictions and level of stringency imposed by their respective governments.[3,5]

Immunization is one of the most cost-effective public health interventions till date and is responsible for averting approximately 1.5 million deaths every year.[6] Secondary public health crises such as outbreaks of vaccine preventable diseases (VPDs) may happen even with temporary interruptions of routine immunization services.[7] During the Ebola outbreak, it was estimated that twice the children died of measles rather than Ebola.[7,8] Many studies done nationally as well as internationally report the effects of the lockdown on routine immunization services for the year 2020 alone.[9-13] However, this disruption was more widespread than reported and there is further need to explore this gap in evidence with respect to the impact on different age groups, nationality and sub-national disruption during the lockdown periods in years 2020 and 2021.[14] The present study was conducted with the objective to estimate the effect of the COVID-19 lockdown during the first and second wave of the pandemic at a tertiary-care paediatric hospital in Jaipur, Rajasthan, India.

METHODS

This record-based observational study was conducted retrospectively at an immunization centre of a tertiary-care hospital attached to a government teaching medical college in Jaipur, Rajasthan. Purposive sampling was done for the selection this institute, as it catered to large volumes of paediatric patients exclusively. Under the UIP, the institute routinely vaccinates all children between 0 and 16 years of age for all the vaccines in the national immunization schedule (NIS) free of cost to the beneficiary.

Under the NIS, the vaccination for pneumococcal pneumonia (PCV) was started in the year 2019 in Rajasthan. Since the service of institutional delivery was not available at this hospital, birth dose vaccines (Hepatitis B, OPV-0 dose and BCG) were given only to those who were admitted in the hospital. Data were collected for a duration of three years, i.e., 1st January 2019 to 31st December 2021 so as to compare the COVID-19 pandemic period (years 2020 and 2021) with matched dates of the pre-pandemic year 2019. The data for number of vaccine doses administered were retrieved from the 'beneficiary immunization record' registers and were triangulated with the 'vaccine stock' registers by the investigator. Vaccination coverage is an ideal measure to assess the vaccination usage in the population, however the number of vaccine doses administered serves as an immediate proxy measure for the same. Data on the period of lockdown and related restrictive measures for routine immunization services were retrieved from the official website of government of Rajasthan (http://rajswasthya.nic.in/Index.htm). The data were entered into MS excel and preliminary adjustments for any calendar variations were made to make the data comparable across all three years. There were no ethical issues involved in the conduct of this study.

Statistical analysis

Continuous variables were described as means/standard deviations. Percentage change was used to compare the doses of various vaccines in pandemic period (years 2020 and 2021) with pre-pandemic period (2019). Significance of difference of means was inferred by unpaired 'T' test and $p<0.05$ was considered significant. Statistical packages for social sciences (SPSS) trial version (v26) (IBM Corp., USA) were used for the data analysis.

RESULTS

The Rajasthan government implemented lockdown in the second quarter of both the years 2020 and 2021 to combat the spread of COVID-19 cases (Figure 1).

Figure 1: Timeline of COVID-19 lockdown and un-lockdown measures in Rajasthan, India.

The total quarterly vaccine doses in second quarter of the years 2019, 2020 and 2021 were 9648, 4833 and 6156 respectively. During the second quarter of years 2020 and 2021, the least number of vaccine doses were administered as compared to other quarters. This is in contrast with the year 2019 were the maximum doses were administered in the second quarter. The least number of doses administered were in April 2020 (666 doses) and May 2021 (1380 doses). The monthly mean

vaccine doses for the second quarter of year 2019, 2020, and 2021 were 3216±25.22, 1611±940.5 and 2052±737.5 respectively. There was significant difference between the monthly mean vaccine doses administered in second quarter of 2019 and 2020 (p=0.042) (Figure 2).

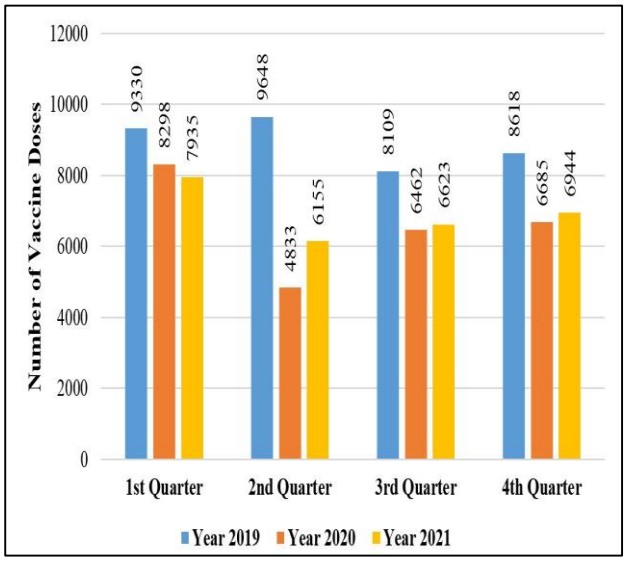

Figure 2: Quarterly analysis of the total number of vaccine doses administered in the years 2019, 2020 and 2021.

On comparing individual vaccine antigens with base year 2019, it was found that second quarter of year 2020 recorded maximum negative difference in dose of Td (10 years) (-98.4%) followed by DPT Booster-2 (-83.6%). The second quarter of year 2021 recorded maximum negative difference in dose of Td (16 years) (-62.5%) followed by Td-10 years (-58.1%) and DPT Booster-2 (-56.5%). PCV showed a positive percent change since administration of PCV began in 2019 itself in Rajasthan (Figure 3 and 4).

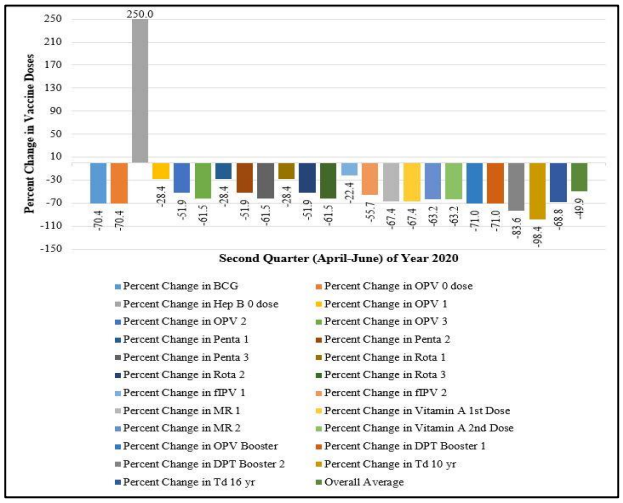

Figure 3: Percent change in various vaccine antigens for the second quarter of year 2020 on comparison with base year 2019.

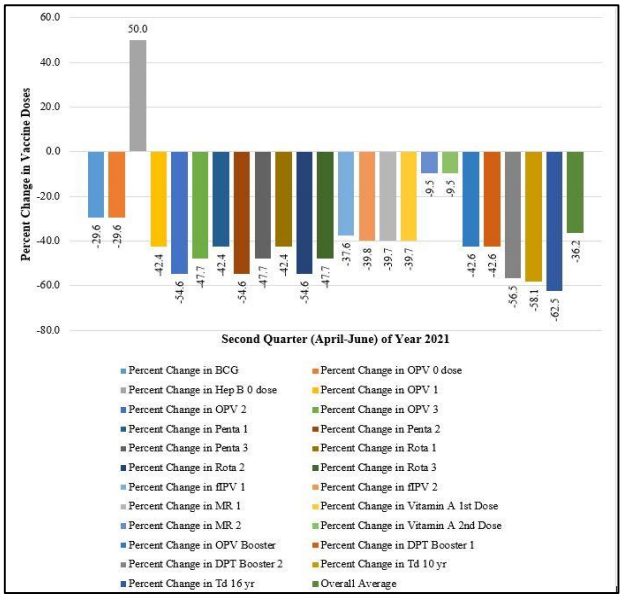

Figure 4: Percent change in various vaccine antigens for the second quarter of year 2021 on comparison with base year 2019.

DISCUSSION

The lockdown implemented by the governments of various countries disrupted the services as well as supply of vaccines globally. The evidence for this is highlighted in various studies across the globe. The effect of lockdown was maximum in the second quarter of both years 2020 and 2021. This coincides with the findings of the present study where declination in the total vaccine doses administered in second quarter of both years were -49.9% and -36.2% respectively. Garg et al in their study across India, reported a significant disruption in the outpatient services with maximum significant reduction in operation of clinics for immunization and non-communicable diseases in the second quarter of year 2020.[15] Yunusa et al in their review of vaccination services in 20 high-income countries (HICs), seven low- and middle-income countries (LMICs), and three regional studies reported a larger-disruptions in LMICs as compared to HICs.[16]

Summan et al in their concluded that the vaccines given later in the immunization schedule in India had greater delay than early-dose vaccines.[17] Bramer et al in their study in US Michigan during first four months of 2020, reported more declination in number of vaccine doses administered in children aged ≤18 years (21.5%) than to children aged ≤24 months (15.5%).[12] These trends were similar to the present study where vaccines in the school going children were more affected than the early childhood vaccines. In the first lockdown (2020), all the major vaccine antigens except those administered at 6 weeks of age (OPV1, fIPV1, pentavalent-1, rotavirus-1) showed negative declination of more than 50%. During the second lockdown (2021), vaccines given at 10 weeks (OPV2, pentavalent-2, rotavirus-2), 5 years (DPT

booster-2), 10 years (Td) and 16 years (Td) of age showed negative declination of more than 50%. This may be because the Rajasthan government passed an order to continue with the birth dose vaccination even during the lockdown phase. However, in another study in Rajasthan by Jain et al reported that during the lockdown, children were more likely to be immunized at 10-12 months (OR 1.761; 95% CI=1.196-2.591; p=0.004) and comparatively less significantly immunized at or before 9 months (OR 0.550; 95% CI=0.367-0.824; p=0.004).[9] An opposite trend was observed in other countries, a study in Gambia by Osei et al reported missing of routine services in newborn children.[18] Harris et al in their study across nineteen countries in South-East Asia and the Western Pacific reported greater impact of COVID-19 on the vaccines administered in infancy (OPV, -79% (IQR -42% to -79%)) than within school-entry aged children -9% (IQR -3% to -31%).[14] This was probably because of disruption in the supply of the vaccines during lockdown. No disruption in the supply of vaccines was reported in the present study. Silveira et al in their study in Brazil reported a drop of about 20% in vaccines administered to children aged two months or older and specifically highlighted a drop in coverage of pentavalent vaccine due to issues regarding importation of the vaccine in the second quarter of the year 2020.[19] Shet et al in their study from 170 countries reported that the lowest number of vaccine doses administered was observed in April 2020 with 57% fewer DTP3 doses administered in WHO South-East Asia region than the previous matched period.[20] This is similar to present study where the pentavalent-3 dose declined by -61.5 % in the second quarter of year 2020. Patel et al in their study during April and May 2020 in Ahmedabad reported a decline in the DPT booster vaccination (87% and 96.6%) and MR vaccination (58%, 78.57%).[10] This decline was similar to the present study where the decline in DPT booster and MR doses for the second quarter were 83.64% and 67.44%, respectively. Though within the same country, these differences may be because of regional differences in number of COVID-19 cases and restrictive measures.

Adilo et al in their study in the regional state of Oromia in Ethiopia, reported disruption in the BCG vaccine availability as compared to other vaccines.[21] The present study records a declination of -70.4% in the BCG dose administration during the first lockdown. Chandir et al in their study conducted in Sindh in Pakistan also reported decline in coverage rates of BCG (highest 40.6%) and other earlier childhood vaccines administered earlier in the routine child immunization schedule declined more than those given later on may be because enrolment into the vaccination program was disrupted more than follow-up services.[22] In the present study, the number of OPV booster doses dropped during both the lockdown periods by -71% and -42.6% respectively. This was similar to a study by Chakrabarti et al on district-level data from multiple sources in India, reported a 60% decline in the final dose of polio series in April 2020.[23] Abid et al in their study in Afghanistan in the second quarter of 2020 reported 21.4% significant (p<0.01) decline in the total immunization coverage with the maximum decline of 28% reported in measles and OPV4.[13]

Strengths

The effect of the lockdown has been shown extensively in this study focussing on both the lockdown periods.

Limitations

Though this study has been well designed yet certain limitations were inevitable. The dose of birth vaccines that were given at the time of institutional delivery were almost left out as the present institute is a paediatric hospital where birth dose vaccines are given only to admitted paediatric cases if they have not taken at time of birth for any reason.

CONCLUSION

The study concluded that there was a significant decrease in vaccine counts in majority of vaccines in second quarter of both the years 2020 and 2021, which coincides with the lockdown period. It is recommended to make alternative arrangements for smooth conductance of routine vaccination during any epidemic and emergencies like lockdown. Also, catch-up immunization should be done vigorously along with active surveillance of vaccine preventable diseases (VPDs).

Recommendations

The findings of this study highlight the need for alternative arrangements for services like vaccination during any epidemic and emergencies such as lockdown.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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