




# The Impact of COVID-19 Pandemic Lockdown on Routine Immunization in the Province of Laghman, Afghanistan

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**Background:** The COVID-19 pandemic, declared by the World Health Organization as a public health international emergency concern in March 2020, has caused serious impacts on individuals, families, communities, and societies across the globe. The COVID-19 pandemic not only disrupted the health systems and the economy, but also significantly impacted routine immunization programs.

**Aim:** To study the impact of the COVID-19 pandemic lockdown on the routine immunization coverage program in the province of Laghman, Afghanistan.

**Methods:** A comparative cross-sectional quantitative study was conducted to understand the impact of COVID-19 on routine childhood immunization during the study period. Secondary data was used from the Ministry of Health from April to July 2020 and compared with the historical data of the same period in 2019. Student *t*-test was used to test the association between the mean changes in the daily immunization coverage. A *p*-value < 0.05 was considered as statistically significant with 95% confidence interval.

**Results:** There was a 21.4% significant (*p* < 0.01) decline in the total immunization coverage during April–July 2020 compared to April–July 2019. This reduction was diverse across all districts and all vaccine antigens. The most affected district was Alingar, and the most affected vaccines were measles and OPV4, with 28% declines, followed by PCV3 at 26%, and DPT3, IPV, OPV3, PCV2 and rotavirus at 23%. The outreach vaccination coverage declined by 56.1% compared to the fixed, at 13.4%.

**Conclusion:** The COVID-19 pandemic seriously affected the routine immunization in Afghanistan. On average, 325 children per day missed out on a lifesaving vaccine in Laghman province which put them at risk of getting preventable diseases. To provide access to routine immunization during pandemics, the study suggests a set of customized interventions to strengthen and sustain routine immunization.

**Keywords:** vaccination, children, COVID-19, pandemics, lockdown

## Introduction

Routine Immunization (RI), defined as

sustainable, reliable and timely interaction between the vaccine dose who deliver it and those who receive it to ensure every person is fully immunized against vaccine preventable diseases

is a key component of primary healthcare systems.<sup>1</sup> Immunization is globally accepted as a cost-effective intervention preventing 2–3 million deaths, illnesses, and disabilities each year from vaccine-preventable diseases.<sup>2,3</sup> Despite the incredible progress in RI in recent years, still around 20 million infants have insufficient access to vaccinations globally.<sup>1</sup>

The COVID-19 pandemic started in Wuhan, China, in December 2019 and was declared as a public health emergency of international concern by the WHO in March 2020. It has caused serious impacts on individuals, families, communities, and societies across the globe. The pandemic has not only disrupted the health systems but has also significantly impacted routine immunization and the global economy.<sup>4,5</sup> The pandemic spread very swiftly worldwide and had infected

197,788,117 people, with 4,219,578 deaths as of August 3, 2021.<sup>6</sup> To mitigate the transmission and reduce the impacts, all countries initiated control measures that unfortunately disrupted the health systems. The United Nations International Children's Emergency Fund (UNICEF), World Health Organization (WHO), and the Global Alliance for Vaccination and Immunization (GABI) warned that at least 80 million children under the age of 1 year were at risk of contracting vaccine preventable diseases during the pandemic.<sup>7</sup> The WHO developed guiding principles of immunization services and priorities to strengthen and sustain primary healthcare, including routine immunization during this rapidly growing pandemic.<sup>8</sup>

To tackle the pandemic, the Government of Afghanistan developed the National Emergency Response Plan for Coronavirus (NERPC) in March 2020 following eight COVID-19 related pillars, in coordination with relevant ministries and other agencies. The NERPC incorporated the UNICEF and WHO preparedness and response plan to COVID-19 with the aims to address the developing demands of COVID-19.<sup>9</sup> The government also applied lockdown in the last week of March 2020, closing all academic institutions, wedding halls, markets, hotels, restaurants, flights, and gathering places. During this period shortages of health workers, medicine, routine vaccines, ventilators, oxygen, other medical and non-medical equipment, and diagnostic kits were seriously observed in the health facilities, which limited the capacity for early diagnosis and treatment of COVID-19.<sup>10</sup> Likewise, high-risk communication by the government made people more scared before the real outbreak started and, as a result, people were hesitant to seek normal health services, including immunization. In March 2020 when lockdown was applied and Polio immunization campaigns stopped in South Asian countries due to COVID-19,<sup>11</sup> the number of polio cases reached 34 in Afghanistan,<sup>12</sup> alongside a reduction in immunization coverage. This situation resulted in limited access to healthcare for the poor and vulnerable people and has further disrupted the already fragile health system in the country.

Laghman province, selected for this study, is one of the 34 provinces of Afghanistan, located in the eastern part of the country with a total estimated population of 501,148 and a population density of 130 people per square kilometer. The main ethnic groups of this province are Pashtuns, Tajiks, and Pashais.<sup>13</sup> The province is composed of six districts, including Alingar, Alishang, Dawlat Shah, Mehterlam, the capital, and Bad Pakh. The province has borders with Panjshir, Nuristan, Kunar, Nangarhar, Kabul, and Kapisa provinces.

Primary healthcare services including RI in Laghman province were delivered through execution of a World Bank funded Basic Package of Health Services (BPHS) and Essential Package of Hospital Services (EPHS) through 67 different types of health facilities, of which 45 health facilities were providing routine immunization. The RI program is following the Afghanistan Expanded Program of Immunization (EPI) schedule through fixed and outreach services.<sup>14</sup> Fixed services are defined as to provide immunization services inside the health facilities on a daily basis, whilst outreach sessions are held in locations other than the health facilities on weekly and monthly bases, from which health workers can go out and return the same day with the aims to attract vulnerable individuals and communities with limited geographical access to the immunization. EPI is one of the main subcomponents of the Basic Package of Health Services (BPHS) under the child health and immunization components in Afghanistan. This program is functioning under the Ministry of Public Health that provides, free of cost, 11 common vaccines, with the aims to prevent vaccine-preventable diseases (VPD). These vaccines include oral polio vaccine (OPV), bacillus Calmette-Guerin (BCG), diphtheria-pertussis-tetanus (DPT), hepatitis B, hemophiliacs influenzas type B, measles, rotavirus vaccine, pneumococcal conjugative vaccine (PCV), and tetanus toxoid (TT).<sup>15</sup>

The objective of this study is assess the impact on the COVID-19 pandemic lockdown on the routine immunization coverage program in the province of Laghman and to know if the immunization rate in children under 5 years old changed in 2020 versus 2019 due to lockdown.

## Methodology

### Study Design

A cross-sectional study was conducted. The outcome differences were explored by girls and boys, fixed and outreach, district, and type of vaccination antigens. This method was selected because it was relatively inexpensive, quicker and faster. Four months data of the lockdown period April–July 2020 and comparison period April–July 2019 have been

taken from the Ministry of Health which is here referred as the study and comparison periods, respectively. These data were extracted directly from the Afghanistan EPI Health Management Information System database (EPI HMIS database). These two sets of data have been compared to see the impact of COVID-19 lockdown on routine childhood immunization.

## Sample Size, Data Collection, and Data Source

This study was carried out in 41 of 45 BPHS health facilities using a purposive sampling method. All 45 health facilities provided routine immunization services to the children in Laghman province. However, four health facilities that had no immunization services in 2019 were excluded from the study with the aims to have an equal number of samples both for comparison and study periods, and to compare the effects of COVID-19 between the groups.

A total of 4 months data (both study and comparison periods) was taken from the EPI Health Management information system (EPI HMIS) of the Ministry of Public Health. The data were extracted by types of vaccine antigens, gender, vaccination administration sites (fixed, outreach), geographical location (district), and health facilities. The data was then transferred into a separate excel database for further analysis and use. The study population were children under 5 years old, the more vulnerable groups to the VPD and with higher morbidities and mortalities globally. The EPI data was collected from the health facilities monthly and then entered into the EPI Health Management Information System data base. This data base is linked with the National Health management Information System data base of the Ministry of Public Health, which is being used to monitor the primary healthcare services trend, including routine immunization coverage under the BPHS and EPHS projects.

## Variables and Statistical Analysis

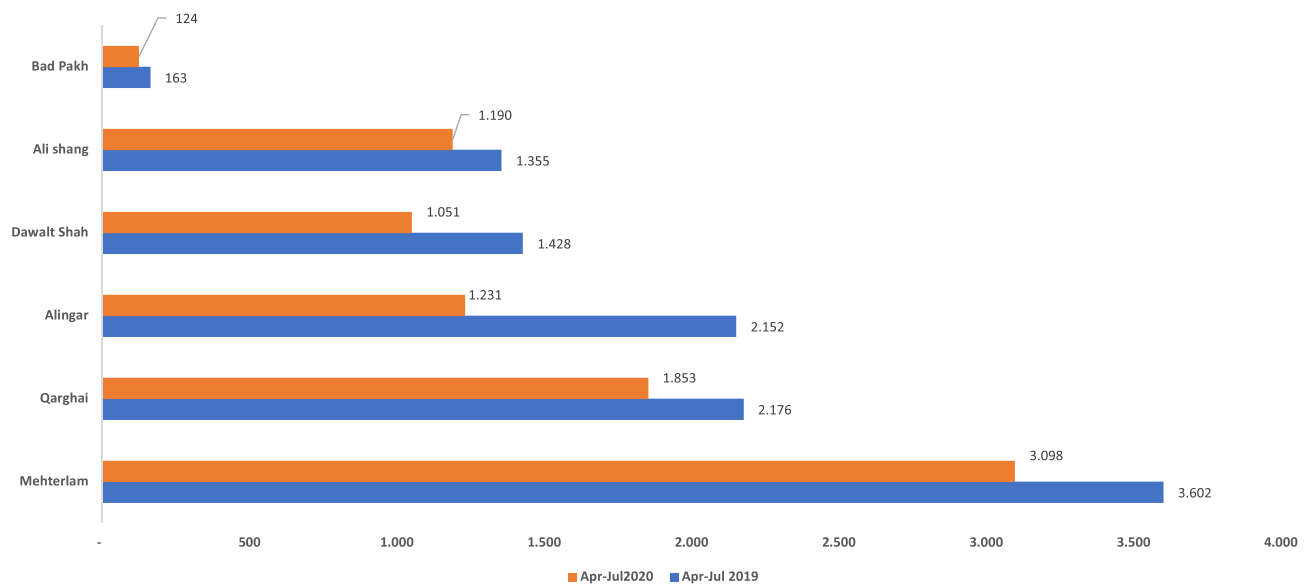
The primary outcome of the analysis was the reception of EPI recommended childhood vaccination (BCG, Polio, DPT, Measles, PCV, Rotavirus) by clients during the study period. The variables studied during the study period April–July 2020 and compared with the same variables of the historical data in April–July 2019, were number of boys under the age of 5 years vaccinated in each month, number of girls under the age of 5 years vaccinated in each month, number of children vaccinated per each type of vaccine antigens, number of children vaccinated in each district, number of children vaccinated in the outreach sessions, and number of children vaccinated in the fixed centers during the study period (April–July 2020). Data was extracted, entered, summarized, cleaned, and cross-checked throughout the study process to ensure the confidentiality and accuracy. For summary measures, percentage, and for continuous variables, mean and standard deviation (SD) were used. Tables, charts, and percentages were used for data analysis and presentation. Epi info statistical software was used to analyze the data. Student *t*-test was done to test the mean changes in the daily immunization coverage among the groups. A *P*-value<0.05 was considered statistically significant.

## Results

From April to July 2020, a total of 145,287 children were immunized in 41 out of 45 health facilities, while during the comparison period this figure was 184,896, showing a decline of 21.4% in overall daily immunization coverage. The mean difference of the total number of vaccine utilization during the study and comparison periods has shown a significant ( $p<0.001$ ) decline in immunization coverage. The total mean during the study period was 8,546 (SD=1,352) and for comparison period the mean was 10,876 (SD=1,645).

To compare the average number of vaccine utilization in each district during April–July 2020 vs April–July 2019, the main changes of vaccine utilization have been a significant ( $p<0.05$ ) decline in immunization coverage across all six districts during the study period compared to the lockdown (comparison) period. A more detailed breakdown by districts is provided in [Figure 1](#).

A reduction in immunization coverage across all vaccine antigens during the study period was found. The most affected antigens with decline were Measles and OPV4 (–28%), followed by PCV3 (–26%), DPT3, IPV, OPV3, PCV2, and Rotavirus (–23%), DPT2 and OPV2 (–22%), PCV1 (–21%), Rota1 (–20%), BCG, Penta1, and OPV1 (–19%), OPV0 (–18%), and Hep B (–6%). [Table 1](#) shows a comparison of vaccine utilization by types of antigens and total decline during April–July 2020 vs April–July 2019.



**Figure 1** Comparison of total doses of vaccines used by each district during April–July 2020 vs April–July 2019.

Mean changes between the average number of vaccine utilization by boys and girls under the age of 5 years in outreach and fixed services during April–July 2020 vs April–July 2019 was not statistically significant. For summary measure percentage was used that indicated on average a 56.1% decline observed in outreach services and 13% in fixed services both for girls and boys. The decline for boys was 9% in fixed and 55% in outreach, while this decline for girls was 18% in fixed and 57% in outreach. However, when both girls and boys were compared against the total coverage during 2019 and 2020, it showed a 17% decline for boys and 26% for girls in total immunization coverage, as shown in Table 2.

**Table 1** Illustrate Comparison of Vaccine Utilization by Types of Antigens and Total Decline During April–July 2020 vs April–July 2019

Data Elements	Comparison Period (April–July 2019)			Study Period (April–July 2020)			Diff % (April–July 2020 vs 2019)		
	Fixed	Outreach	Total	Fixed	Outreach	Total	Fixed (%)	Outreach (%)	Total (%)
BCG	11,784	2,171	13,955	10,544	814	11,358	-11%	-63%	-19%
HepB	7,087	56	7,143	6,678	11	6,689	-6%	-80%	-6%
IPV	9,434	2,426	11,860	8,030	1,131	9,161	-15%	-53%	-23%
Meas/MRI	7,379	2,451	9,830	6,051	982	7,033	-18%	-60%	-28%
OPV-0	9,134	814	9,948	8,023	123	8,146	-12%	-85%	-18%
OPV-1	9,825	2,404	12,229	8,806	1,053	9,859	-10%	-56%	-19%
OPV-2	8,941	2,247	11,188	7,701	1,077	8,778	-14%	-52%	-22%
OPV-3	9,434	2,426	11,860	8,030	1,131	9,161	-15%	-53%	-23%
OPV-4	6,017	1,777	7,794	4,894	701	5,595	-19%	-61%	-28%
PCV-1	9,057	2,223	11,280	7,879	985	8,864	-13%	-56%	-21%
PCV-2	8,098	2,096	10,194	6,856	1,011	7,867	-15%	-52%	-23%
PCV-3	8,418	2,177	10,595	6,814	1,013	7,827	-19%	-53%	-26%
Penta-1	9,825	2,404	12,229	8,793	1,066	9,859	-11%	-56%	-19%
Penta-2	8,941	2,247	11,188	7,701	1,077	8,778	-14%	-52%	-22%
Penta-3	9,434	2,426	11,860	8,029	1,132	9,161	-15%	-53%	-23%
Rota-1	9,287	2,281	11,568	8,285	985	9,270	-11%	-57%	-20%
Rota-2	8,090	2,085	10,175	6,928	953	7,881	-14%	-54%	-23%
<b>Total</b>	<b>150,185</b>	<b>34,711</b>	<b>184,896</b>	<b>130,042</b>	<b>15,245</b>	<b>145,287</b>			<b>-21.4%</b>

**Table 2** Illustrate Changes of Vaccination Utilization by Gender (Girls, Boys) vs Fixed and Outreach During the Study and Comparison Period

Gender	Comparison Period (April–July 2019)		Total	Study Period (April–July 2020)		Total	Diff in Percentage		
	Fixed	Outreach		Fixed	Outreach		Fixed %	Outreach %	p-value
Boys	75,801	17,615	<b>93,416</b>	69,321	7,909	<b>77,230</b>	–9%	–55%	0.115
Girls	74,384	17,096	<b>91,480</b>	60,721	7,336	<b>68,057</b>	–18%	–57%	
<b>Total</b>	150,185	34,711	<b>184,896</b>	130,042	15,245	<b>145,287</b>	<b>–13.4%</b>	<b>–56.1%</b>	

## Discussion

This study provided a comprehensive analysis of the impact of COVID-19 lockdown on routine immunization coverage in Laghman province. The overall immunization declined by 21.4% was in consistency with the study result conducted in England, with a 19.8% drop in Measles–Mumps–Rubella (MMR) vaccination observed during the COVID-19 pandemic.<sup>16</sup> This study also found a 56.1% decline in vaccine coverage through outreach and 13.4% in fixed facilities. With this calculation on average 325 children per day were missing out on lifesaving vaccinations in Laghman province, which has put them at risk of vaccine-preventable diseases, especially to polio and measles. This drop in immunization coverage could be relatively due to a reduction in provision of the healthcare, insecurity, disruption in global manufacturing and supply chains, closures of borders, and global suspension of vaccine companies that led to shortages of vaccine and other supplies in the county. High-risk communication and fear of exposing with COVID-19 infection through engaging each other has also made people reluctant to leave homes and seek routine healthcare. A study in Saudi Arabia also found that a 60.9% delay in routine immunization was due to fear of getting COVID-19 infection during the pandemic, which supports the findings of this study.<sup>6</sup> The reasons for this drop apart from the lockdown measures and fear of transmission were insecurity and frequent armed conflicts between the government and oppositions that limited access to the health services.

The COVID-19 pandemic disrupted basic healthcare deliveries worldwide, including routine immunization that protects millions of children from vaccine-preventable diseases (VPD). The interruption of routine immunization during the COVID-19 pandemic may lead to a secondary health crisis like a measles outbreak during or after the recovery phase, intensify the economic damage, and exacerbate morbidity and mortality among children under 5 years old globally.<sup>17</sup> A study on the Ebola outbreak in 2014–2015 also found a higher number of deaths due to secondary diseases during the outbreak compared to the Ebola itself.<sup>18</sup>

Researchers have found serious declines in routine immunization during pandemics.<sup>26</sup> The National Advisory Committee on Preventable Disease on Immunization in Canada (NACI) has noted a serious outbreak of vaccine-preventable diseases in Canada.<sup>19</sup> A mathematical modeling from the London School of Hygiene and Tropical Medicine suggested that for each COVID-19 related death due to infection acquired during vaccination visit around 29–347 future child deaths could be prevented with sustained immunization.<sup>20</sup> A study in a tertiary care center in India found a significant decline in attendance of routine immunization during the lockdown, this reduction was mainly in May 2020 comparing to April 2020 because of the peak of the pandemic in the area.<sup>21</sup> Similarly, another study in Rajasthan, India, found a disruption to immunization services resulted in children missing immunization during the COVID-19 lockdown. This decline was largely found among children from poorer households, who were less educated, and residing in COVID-19 red zones.<sup>22</sup> In June 2020, a web-based survey conducted by WHO, UNICEF, and GAVI reported that, out of 61 countries, 85% showed a low level of vaccination in May 2020 compared to January and February of the same year, and 73% reported a decrease in demand, mainly due to concerning COVID-19 infection, limited public transport, and maintaining physical distancing.<sup>23</sup>

Many studies worldwide reported a serious decline and disruption in the routine immunization services during the pandemic, which supports the findings of this study. After the National emergency declaration in the United States of America (USA), a reduction in routine immunization was observed, mostly in children older than 1 month.<sup>24</sup> An African

study on COVID-19 and routine immunization suggested that risk of deaths due to vaccine-preventable disease outweighed the risk of death due to possibility contracting COVID-19 during a clinic visit.<sup>25</sup>

## Strengths and Limitations

This study informs public health authorities, health professionals, policy-makers, and other stakeholders about COVID-19 impacts on routine immunization in Afghanistan. This study gives a hint of understanding the situation to the policy-makers in designing context-specific strategies and interventions that can sustain routine immunization as a part of the routine health services during and after pandemics. The findings of this study can also help health authorities and other professionals to take it as a reference for further studies on the subject and to highlight a wider picture of the situation and way forward. This study cannot be generalized in all settings, as the level of health systems resilience to COVID-19 response mechanisms, and level of resources, are varied among different settings and regions. Likewise, this study cannot represent the entire population as it is conducted only in one province. Similarly, the study could not determine if the decline in vaccine coverage is only due to the lockdown or some other factors also played a role, for example, insecurity and economic problems.

## Conclusion

This study revealed that on average 325 children per day have missed out on their vaccination in Laghman province across all antigens and all districts. These children were being exposed to the vaccine-preventable diseases like measles and polio. There was also a high chance of secondary outbreaks during and after the pandemics. So, the study suggests that finding these missed children and offering them a vaccination can reduce the risks of VPD. The study findings can benefit the Ministry of Public Health, policy-makers, and other stakeholders in designing specific strategies and interventions on how to sustain and strengthen primary healthcare services including routine immunization to increase vaccination coverage during pandemics and to prevent possible outbreaks of VPDs in the country. Maintaining routine immunization during a pandemic following WHO guidelines, strengthening outreach and fixed services, ensuring supplies, capacity building of health workers, and massive campaigns have imperative roles in improving community awareness about the danger of postponing vaccines and increasing the coverage during pandemics. In preparation and prevention for future pandemics, the study also suggests a tailored intervention and strategies implemented by all countries to promote access and achieve a significant increase in the number of vaccinations during pandemics as well as to control the level of fear and anxiety provoked by the pandemics and media.

## Ethics Approval and Consent to Participate

Afghanistan MoPH permission was obtained to extract and use the vaccination data. Individual consent was not obtained as secondary data was used, and individual personal information was not available in the database. The study was evaluated by the University of Oviedo and have waived the need for ethical approval.

## Authorship Contribution

All authors made substantial contributions to the conception and design, acquisition of data, or analysis and interpretation of data; took part in drafting the article or revising it critically for important intellectual content; agreed to submit to the current journal; gave final approval of the version to be published; and agree to be accountable for all aspects of the work.

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## Disclosure

The authors have no financial or other interest that should be known to readers related to this study.

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