DOI: https://doi.org/10.54393/pbmj.v8i6.1261

PAKISTAN BIOMEDICAL JOURNAL
https://www.pakistanbmj.com/journal/index.php/pbmj/index
ISSN (E): 2709-2798, (P): 2709-278X
Volume 8, Issue 06 (June 2025)

Original Article

OPEN ACCESS

Impact of COVID-19 Pandemic on the Expanded Programme on Immunization (EPI) Vaccination Uptake in Lahore, Pakistan - A Cross-Sectional Study

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ARTICLE INFO

Keywords:
COVID-19, Expanded Program of Immunization, Pandemic, Vaccination

How to Cite:
Gohar, A., Farooqi, H. H., Tariq, H., Khan, A. U., Khan, A. R. S., Shah, S. S. H., & Afzal, U. (2025). Impact of COVID-19 Pandemic on the Expanded Programme on Immunization (EPI) Vaccination Uptake in Lahore, Pakistan - A Cross-Sectional Study: COVID-19 Pandemic on the EPI Vaccination Uptake. Pakistan BioMedical Journal, 8(6), 16-19. https://doi.org/10.54393/pbmj.v8i6.1261

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Received Date: 30th April, 2025
Revised Date: 10th June, 2025
Acceptance Date: 17th June, 2025
Published Date: 30th June, 2025

ABSTRACT

The 2019 (COVID-19) Coronavirus pandemic has presented a variety of challenges which have not only affected the society's health but also the economies, the sociocultural trends and political situations. Routine health-related programs have been harmed. **Objectives:** To provide an insight into the prevalence of delay of Expanded Program of Immunization (EPI) and its causative factors during the pandemic in the province of Punjab, Pakistan. **Methods:** After approval from the Ethical Review Board, this prospective, cross-sectional study was carried out at Ameer ud Din Medical College (AMC) from July 1, 2023, to September 1, 2023. An interview-based survey was conducted across the suburbs of college. **Results:** About 66% participants were female parents, out of which 51.3% indicated that their children's vaccinations had been delayed for more than a week. Participants who had delayed their children's vaccination visits owing to a fear that the children would not be able to follow the proper precautions for protection against COVID-19 were 10%, while 16% of respondents stated that the fear of COVID-19 exposure while traveling to and from the health facility was the reason for the delay in vaccination. Fear of COVID-19 exposure at the health facility caused 33% of cases to delay the vaccination uptake. **Conclusions:** It was concluded that COVID-19 harmed EPI-associated vaccination uptake. Solutions to the reasons for delay were ignored by the involved parents and healthcare setups.

INTRODUCTION

The 2019 Coronavirus pandemic (COVID-19) has been found extremely contagious, especially through aerosol transmission [1, 2]. By the middle of April 2020, it had been reported that around two million cases and 120,000 deaths from COVID-19 had occurred across the world [3, 4]. On February 26, 2020, the first case of COVID-19 was registered in Pakistan [5, 6]. On March 23, 2020, the restriction on movement was introduced. Knowledge of the virulence and the aftereffects of the disease was still little known at that time [7]. The situation with the current pandemic spread of COVID-19, the unprecedented effects of which have left an indelible trace in the development of the social context in the world, as well as the state of delivery of the basic system of health services, will entail a strong impact on the management of other infectious ailments. Based on this, there should be a focus on how it can affect vaccine delivery, which is a very essential component of our health system. The risks of morbidity and mortality posed by vaccine-preventable diseases (VPDs) to countries that already have poor coverage rates will be compounded in case their coverage is affected in any way or the other [8, 9]. VPDs cover polio, measles, mumps, rubella, diphtheria, pertussis, tetanus, hepatitis B, rotavirus diarrhea, severe childhood forms of tuberculosis,

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meningitis and pneumonia by Haemophilus inflenza type B, pneumococcal pneumonia and Japanese encephalitis [10, 11]. FIC is the child who has attained all the doses of the required immunizations as recommended by the immunization schedule [12]. The COVID-19 pandemic unfolds against the background of insufficient immunization in our country. With Coronavirus and the resultant lockdowns, the EPI machinery has been badly disrupted. Fixed immunization (or vaccination) centers located within basic health units are unable to cater to their catchment population. Shifts in health-seeking behaviours due to an urgent need for social distancing and complete and partial lockdowns may be contributing to a delay in routine childhood vaccination visits [13, 14]. Other contributing factors may be a parent's fear of contagion, overstretched health services, and a reallocation of government resources from immunization activities to the control of COVID-19 [15]. It is evident from history that past global disease outbreaks, pandemics and wars created the lack of access to health care facilities, leading to an increase in morbidity and mortality. Similarly, COVID-19 weakened our already frail healthcare systems [16]. The primary research question in this study was to examine the impact of the COVID-19 lockdown on routine immunization in Pakistan.

This study aims to measure the delay in immunization rates during this pandemic in Pakistan, the duration of delay in immunization and the reasons for delay, including reasons specifically related to the spread of the COVID-19 pandemic. The findings of our research are paramount in identifying barriers to timely vaccination in public health emergencies and thus for implementing pandemic preparedness strategies at the national level.

METHODS

This prospective, cross-sectional study was conducted for a duration of one month from July 1, 2023, to September 1, 2023. A sample size of 197 was calculated using the Open Epi calculator with a reference population [1] of 400, a confidence interval of 95%, a margin of error of 5% and a population proportion of 50%. Approval was taken from the Ethical Review Board of Ameer-ud-Deen Medical College, Post Graduate Medical Institute, under the reference number 00-15-A-2023. The study followed all relevant ethical guidelines, and approval was obtained prior to data collection. Participants from the suburbs of Post Graduate Medical Institute, like Rehmanpura and Shahdara, were recruited in this study using non-probability, consecutive sampling and the following selection criteria. The study population included parents from the suburbs of Lahore city, having children under two years of age and a vaccination facility available. Parents who do not have children below the age of two were excluded. Parents not present at home at the time of the survey were also excluded. Two researchers surveyed the houses in the above-mentioned locations and performed a survey-based scientific study. Informed consent and confidentiality of the data were maintained throughout the process. The questionnaire had four parts, including the demographic information of parents, immunization status, immunization during the COVID-19 outbreak, and the potential factors that parents could not or did not refuse to vaccinate their child or children. The survey reliability was confirmed with the help of the Cronbach alpha coefficient (0.78), and it was recognized as acceptable. It was developed in English and translated into Urdu using the assistance of an expert. The study asked questions in the native language and marked the answers accordingly. Data were collected using the following categorical variables: gender, age categories, education level of subjects, type of family (nuclear or combined), and employment. Collected data were compiled into SPSS version 26.0 and sent for data analysis to a statistician. Mean, median, mode and range values will be calculated for quantitative variables like age, frequencies and percentages for categorical variables.

RESULTS

A total of 315 parents were invited to take part in the research in but 77 respondents did not participate because the questionnaires are incomplete. A total of 238 participants carried out the analysis, which was above the minimum calculated sample size. Young mothers below the age of 30 years were the majority of participants. Most of the parents were graduates and educated (Table 1).

Table 1: Demographic Information of Included Participants

Category	Frequency (%)
Gender Distribution	
Female	157 (65.9%)
Male	81 (34.1%)
Category of Age	
Below 30	125 (52.5%)
Above 30	113 (47.5%)
Level of Education	
Postgraduate Level	63 (26.5%)
Uneducated	30 (12.6%)
Up To Graduation	145 (60.9%)
Type of Employment	
Government Service	50 (21.0%)
Private Sector	60 (25.2%)
Self Employed	128 (53.8%)
Type of Family	
Combined	157 (65.9 %)
Nuclear	81 (34.1%)

The majority of parents had their children's vaccinations within the prescribed time in past. But those who have had their children's vaccination schedules disrupted during the COVID-19 pandemic were afraid of contracting COVID-19 at

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the healthcare facilities(Table 2).

Table 2: Course of EPI Vaccination in the COVID-19 Pandemic and the Reasons Behind the Delay

Questions	Frequency (%)
A - Have your children's vaccinations always been according to schedule?	
No	31(13.0%)
Yes	207(87%)
B - Were any of your children's vaccinations due since the start of the COVID-19 pandemic in Pakistan, i.e. since the 15th of March 2020?	
No	0(0%)
Yes	238(100%)
C - If yes, then was the vaccination delayed for more than a week?	
No	116(48.7%)
Yes	122(51.3%)
D – Reasons behind the delay in vaccination	
Fear of children being unable to follow proper precautions to avoid COVID-19 exposure	12(9.83%)
Fear of COVID-19 exposure during going to and coming back from the health facility	20(16.39%)
Fear of exposure to COVID-19 at the health facility	40(32.78%)
Miscellaneous reasons	50(40.98%)

DISCUSSION

This research paper contains an evidence-based and detailed report on how the COVID-19 pandemic has affected immunization coverage in a sample population. The findings of the study revealed that COVID-19 hurt the timeliness of childhood immunization in Lahore city, Pakistan.This is the first study, to the best of our knowledge, measuring the impact of the COVID-19 pandemic on childhood immunization in the province of Punjab, Pakistan. A study in the United States showed that most patients failed to attend one of their scheduled visits (50%) and some of the patients missed two visits or more (27%). DTaP was the most common vaccine being missed during lockdown [1]. A Brazilian study reported that their infants were given an average of 10.6 doses out of 13 doses during lockdown, thus making them 2.4 doses short of the full immunization schedule [15]. The findings of a study conducted in Saudi Arabia which reported a delay of more than one month in the immunization of children by 23.4% of parents and fear of being infected by COVID-19 being the most common cause of delay are similar to the results of our study showing delay for more than one week of 51.3 % of parents and fear of being infected by COVID-19 being the second most common cause [14]. The results of our study are in line with the reports of Chandir *et al.*, who note a fall of vaccination rate by 51% in Sindh, Pakistan, affecting rural areas more than urban areas, and the outreach vaccination service more than fixed center services [17]. Our results coincide with the study by Shattock *et al.*, and Osei *et al.*, study, which showed the negative impact of conflict and war on immunization coverage [18, 19].Some factors identified in research undertaken by Bimpong *et al.*, are the reason behind the decline in registered immunizations. One of the greatest challenges that have been experienced in many other countries is the reluctance by parents to vaccinate their kids due to fear of infecting their kids in the process.The problem of vaccine hesitancy is already aggravated by preconceived ideas and myths about vaccination and misinformation, as well as rumours about COVID-19. Besides, the prohibition of social activity by the authorities and the absence or increase in the cost of transportation can also have played the key role in the reduction of the coverage [20].Our study showed that 40.98% of the participants had similar apprehensions. Another study by Saso *et al.*, in the United Kingdom, revealed that the causes of limiting the access of pregnant women and families/infants to antenatal clinics, primary health care centers to carry out their usual check-ups and follow-through the EPI schedule, respectively, were lockdown measures and social distancing [3]. We deduce that there is a huge impact of the pandemic, war and conflicts on immunization coverage. This could put people at more risk of vaccine-preventable disease (VPDs) outbreaks. Along with constant attempts to prevent the war, conflict and pandemic crises, there is a need to have strategies on more innovative ways of delivery or distribution of vaccines or meeting the surge in demand. It is essential to improve the Expanded Program on Immunization (EPI) performance with some infrastructure investments that can be justified by the extent of damage inflicted by the crises, or rather decentralized funding.

CONCLUSIONS

It was concluded that children in the sampled population had low EPI vaccinations due to the COVID-19 pandemic crisis. The main reason was the fear of getting COVID-19 in healthcare institutions, and then other reasons were connected with travelling and children not being able to follow protective strategies. These results identify essential challenges to routine immunization in times of public health crisis. To fill these gaps, the health leaders are to introduce a specific set of measures to decrease the level of fear toward vaccination, enforce more stringent measures of infection prevention at vaccination centers, and introduce mobile or community-based vaccine teams to support increased access. Incorporation of these strategies in the national immunization programs would ensure vaccination coverage is not affected in the case of future pandemics or emergencies.

Authors Contribution

Conceptualization: AG, HHF
Methodology: HT, AUK
Formal analysis: ARSK
Writing review and editing: SSHS, UA

DOI: https://doi.org/10.54393/pbmj.v8i6.1261

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

Source of Funding

The author received no financial support for the research, authorship and/or publication of this article.

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