Open Access

ORIGINAL ARTICLE

Impact of COVID-19 Pandemic on Routine Vaccination Coverage among Children of Age 15 to 23 Months in Lahore, Punjab, Pakistan

Komal Khadim Hussain[1], Hasan Danish[2], Farah Ahmad [3]

Department of Pediatric Medicine, Services Institute of Medical Sciences, Lahore, Pakistan[1]
Department of Community Medicine, Ziauddin Medical College & University Karachi, Pakistan [2,3]

ABSTRACT

Background: The COVID-19 pandemic affected all socio-economic activities including the provision of routine vaccinations.
Objective: This study determined the effect of the COVID-19 pandemic on routine vaccination rates among children aged 15-23 months.
Methods: A cross-sectional study was conducted in Lahore, from April 2021 to November 2021. The study included 750 children aged 15 to 23 months from the District of Lahore. A structured questionnaire was used to collect data from the outpatient department of Services Hospital, Lahore after informed consent. The data was analyzed by using SPSS version 26. The p-value <0.05 was considered statistically significant.
Results: Among the study participants, 567 (75%) children had completed their routine vaccines according to the card. One hundred and eighty-three (24.2%) children were not fully vaccinated. Seven hundred and twenty-seven (96.2%) children had oral polio 1 (OPV I), while 693 (91.7%) had Pneumococcal 2 (PCV II), and 696 (92.1%) had taken the Pentavalent 1 vaccine. Measles 2 was received by only 604 (79.9%) children. Sixty-three (8.3%) mothers and caregivers were unaware of the need for vaccination. Twenty-seven (3.6%) mothers had no time to get their children vaccinated, and 27 (3.4%) were uninformed about their children's vaccination appointments.
Conclusion: The vaccination rate was 36% lower among children of ages 15-23 months in the Lahore district compared to the pre-pandemic era.

Key Words: Routine vaccination coverage, COVID-19 pandemic, Children, Pakistan

Doi: https://doi.org/10.53685/jshmdc.v4i1.149

Corresponding Author:
Dr Komal Khadim Hussain
Postgraduate Trainee
Department of Pediatric Medicine
Services Institute of Medical Sciences, Lahore
Email address: drkomalkhadimhussain@gmail.com
Received: 21.02.2023, Revised: 09.05.2023,
Accepted: 16.06.2023

How to cite this article: Hussain KK, Danish H, Ahmad F. Impact of COVID-19 pandemic on routine vaccination coverage among children of age 15 to 23 months in Lahore, Punjab, Pakistan. J Shalamar Med Dent Coll. 2023; 4(1): 53-59. doi: 10.53685/jshmdc.v4i1.149

INTRODUCTION

The coronavirus disease (COVID-19) disrupted domestic life around the globe. Parents were worried because of school closures, work from home, and physical isolation. Contagious infections like COVID-19 adversely affected the routine vaccination programs of the children. The child's welfare, development, and safety have undoubtedly been harmed by disruptions to routine activities, domestication, friendships, and civic matters.[1]

Due to their fear of catching the disease, people are no longer seeking out necessary health-related services like neonatal screening, pre-

birth care, or vaccination as a result of the COVID-19 pandemic. Vaccine-preventable diseases (VPDs), like measles and polio, tuberculosis, hepatitis B, diphtheria, pertussis, and tetanus can be more serious than COVID-19 itself, mainly in unvaccinated kids.[2,3]

The pandemic has further aggravated this problem as reports suggest that in 13 underdeveloped nations of the world, around 13.5 million people lack measles, polio, and human papillomavirus vaccinations.[3] Before the COVID-19 pandemic Pakistan had age recommended vaccination rate of 88%; during the pandemic, it was only 52%.[4] Previous studies showed lower immunization rates in children during the COVID-19 disease.[5] Data from OPD clinics in 51 primary healthcare stations across the country, found significant reductions in clinic operations for immunization services.[6]

Many parts of the world have been affected by extensive global disruption in routine immunization in children, predominantly in the early pandemic stages. There are growing concerns regarding the resurgence of vaccine-preventable diseases, particularly measles, as the downstream impact may be even greater in resource-constrained settings and economically poorer populations.[7] Interruption in routine vaccinations caused by COVID-19 is more widespread in South East Asian Region and the countries of the Western Pacific Part than previously reported, and has impacted the process of routine vaccination both in the public and private sectors. Parents were worried about getting COVID-19 infection if they go for vaccination, getting appointments, travel and movement restrictions, and restricted access to healthcare were the main causes that were mentioned.[8]

Various studies have been carried out to gauge the vaccination rate in infants between the ages of 12 and 23 months. To date, no research has yet been done to determine how COVID-19 has affected vaccination rates among Pakistani children between the ages of 15 and 23 months. The present study was done to determine the effect of the COVID-19 pandemic on routine vaccination rates among children in Lahore between the ages of 15 and 23 months.

METHODS

A cross-sectional study was conducted in Lahore, from April 2021 to November 2021. The study included children aged 15-23 from different tehsils of District Lahore. A convenient sampling technique was used. The study was approved by the Ethical Review Committee of the Services Institute of Medical Sciences, Lahore under reference No.IRB/2022/985/SIM S. Written informed consent was taken from the parents of the study participants.

The formula for population proportions was, n = (Z a/2)2 P (1-P)/d2, for the calculation of sample size. The sample size calculation was based on the following assumptions: 95% level of the confidence interval, which yields Z /2 = 1.96 on the standard normal distribution curve; 5% margin of error, p of 50% was taken to calculate the largest sample extent. The sample size came out to be 384 with a 20% waste rate or 450, but we enrolled 750 children. To collect the necessary data, a structured questionnaire was used. Data was collected from the OPD of Services Hospital, Lahore. Questionnaires were made in English and Urdu and also translated in the local languages. Each questionnaire was completed by the researcher herself to guarantee consistency, thoroughness, and accuracy. Before determining the child's vaccination status, the data collector required mothers or other caregivers to present the vaccination card. We questioned the mothers regarding the number of immunizations the indexed child has received. The method of administration (oral or injection), the presence of a scar, and the age of the child at the time of vaccination were all asked.

Statistical Analysis

The SPSS version 26 was used to analyze the data. Descriptive statistics like frequencies, percentages, and cross-tabulations were used to

compile the data. The main subjects of the analysis were the socio-demographic profiles of the mothers or caregivers, the indexed children, the presence of the vaccination card, and mothers' awareness of vaccination-related issues. The p-value <0.05 was considered statistically significant.

RESULTS

Among the study participants, 446 (59%) were boys and 304 (40.2%) were girls. The average age of the children was 18.4 months. About 330(43.7%) and 311(41.1%) of the respondents were illiterate and could read and write respectively. Six hundred and eighty-six (90.7%) custodians were married. Six hundred and eighty-six (90.9%) mothers were housewives. The majority of the respondents (430; 56.9%) had access to a health center nearby that offers immunization services. Approximately 516 (68.3%) of respondents say they walk to the closest medical facility to receive the service, and 512 (67.7%) say it takes them less than 30 minutes to get there (Table 1).

About 729 (96.4%) of the children surveyed have a vaccination card. About 183 (24.2%) of the kids lacked one or more vaccinations. Of the children surveyed, 727 (96.2%) received oral polio vaccine 1, 693 (91.7%) received pneumococcal conjugate vaccine 2, and 696 (92.1%) received oral pentavalent vaccine 1. Only 604 (79.9%) of children were given the second dose of the measles vaccine, and 567 (75%) were fully immunized using a card only (Table 2).

The following reasons were given by mothers and other caregivers for why they did not take their children for vaccinations at all or did not finish them on time: 63 (8.3%) people did not know that vaccinations were necessary, 27 (3.6% of mothers) did not have enough time, and 27 (3.4%) did not know that it was necessary to make a second appointment after the first one (Figure 1).

Among all mothers/caregivers, approximately 89.7% and 41.5% are aware of the recommended age for vaccination and that vaccines can prevent diseases that can be prevented by vaccines, respectively.

Table 1:Demographic profile of custodians and index children

Variable	Category	n (%)
Gender	Male	446(59.0%)
	Female	304(40.2%)
Age(months)	15- 17	153(20.2%)
	18- 20	108(14.3%)
	21- 23	489(64.7%)
Birth order	First child	220(29.1%)
	Second child	198(26.2%)
	Third and above	332(43.9%)
Main caregiver	Mother	70(9.3%)
	Father	21(2.8%)
	Both	645(85.3%)
Age (Year)	18-24	170(22.25%)
	25-31	329(43.5%)
	32-38	201(26.6%)
	≥39	50(6.6%)
Education	Illiterate	330(43.7%)
	Who can write & read	311(41.1%)
	College/university & above	109(14.4%)
Religion	Orthodox	2(0.2%)
	Muslim	731(96.7%)
	Others	17(2.2%)
Marital status	Married	686(90.7%)
	Widowed	39(5.2%)
	Divorced	25(3.3%)
Occupation	Housewife	687(90.9%)
	Government worker	24(3.2%)
	Other	39(5.2%)
Nearest Health facility type	Hospital	146(19.3%)
	Health Center	430(56.9%)
	Health Post	155(20.5%)
	Private clinic	19(2.5%)
Time taken to reach there	< 30 min	512(67.7%)
	≥30 min	238(31.5%)
Transportation used	Automobile	234(31.3%)
	By foot	51(68.3%)

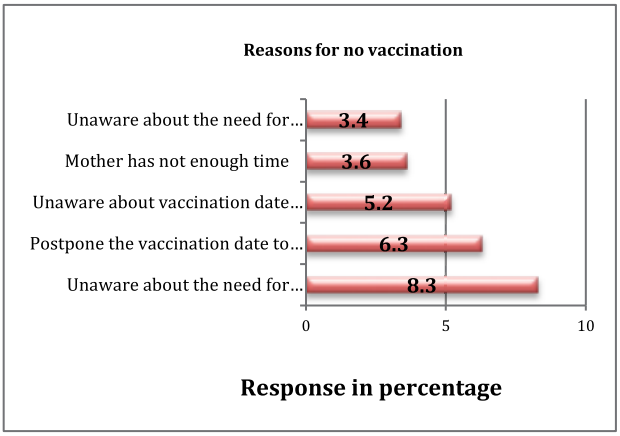

Figure 1: Reasons given by mothers and other caregivers for no vaccination

Table 2. Vaccination details on cards	
Vaccination	**n (%)**
BCG	709 (93.8)
Polio 1	727(96.2)
Polio 2	729(96.4)
Polio 3	729(96.4)
PENTA 1	696(92.1)
PENTA 2	693(91.7)
PENTA 3	693(91.7)
PCV 1	693(91.7)
PCV 2	693(91.7)
PCV 3	693(91.7)
ROTA 1	693(91.7)
ROTA 2	693(91.7)
Measles 1	698(92.3)
Measles 2	604(79.9)
Fully vaccinated	567(75)
Not fully vaccinated	183(24.2)

Table 3: Mothers' knowledge about routine vaccination for children	
Variable	**n (%)**
Knowledge of the side effect of the vaccine	22 (2.9%)
Understanding of the steps taken to prevent vaccine side effects	4(0.5%)
Heard about the vaccine campaign	644(85.2%)
Knowledge about the location of the place where regular vaccination given	680(89.9%)
Knows appointment time for vaccination	669(88.5%)
Understanding of Childs' recommended age for vaccination	677(89.6%)
Knowledge about the child's age to start vaccination	678(89.7%)
Information about the regularity of child vaccinations administered by health institutions	665(88%)
Knows that vaccine prevents Vaccine-Preventable Diseases	314(41.5%)

Approximately 88% of respondents are aware of how frequently they should visit health centers for completion of the vaccinations (Table 3).

DISCUSSION

This important study examined the impact caused by the COVID-19 pandemic on the vaccination rate among children aged 15 to 23 months in District Lahore, Pakistan, as well as the contributing factors to vaccination coverage. Data from vaccination cards showed that 75% of kids had received all recommended vaccinations. This study found that Measles 2 vaccination coverage is most affected, with only 79% of the included kids receiving the vaccine. As per recommended age, the coverage rate during the COVID-19 spread was 36% lower than before the COVID-19 outburst.[9] Fear of catching COVID-19 while visiting a medical locality for vaccination services could be one explanation for this. The emergence of COVID-19 in Pakistan was shown by a similar study to be related to significant drops in routine immunizations, which are consistent with what has been observed nationally and internationally.[10,11]

The global DTP3 serving rate has dropped to 85%, with Nepal experiencing the largest decline (9%). MCV1 coverage decreased across Southeast Asia from 94% in 2019 to 88% in 2020, with Indonesia experiencing the largest decline (12%). The overall vaccination rate for HepB3 in Southeast Asia fell significantly (from 85% to 91% in 2019). The Republic of Korea saw the biggest drop in polio 3 vaccination rates (from 98% in 2019 to 70% in 2020).[12]

Central Asia also experienced significant changes, predominantly in Azerbaijan (Hib3 rates decreased from 94% in 2019 to 79% in 2020, polio 3 rates decreased from 96% to 85%, MCV1 rates decreased from 98% to 82%, and MCV2 rates decreased from 97% to 79%.[12] Last but not least, in Oceania, there have been some countries where vaccine coverage has shrunk, most remarkably Samoa (30% for MCV1) and Kiribati (34% for MCV2).[12] The general BCG vaccination rate dropped from 87% to 93% during 2020 when compared to 2019, with India experiencing a larger decline (7%) than the rest of the world.[12] In the Americas, routine vaccination rates decreased for the following diseases: BCG, MCV1, PCV3, and polio3, from 83% to 68%, 87% to 85%, and 82% to 76%, respectively.[13] Significant drops in MCV1 and

MCV2 have arisen in Bulgaria (from 97% in 2019 to 87% during 2020, and from 95% to 84%) and Ukraine (from 93% to 85% and 92% to 82%, respectively) in Europe. In Montenegro, the coverage rates for BCG, HepB3, MCV1, and MCV2 all declined between 2019 and 2020, from 80% to 67%, 33% to 24%, and 80% to 76%, respectively.[14] Similarly, In the Eastern part of Saudi Arabia, the routine vaccination programs for children have been impacted by COVID-19. It caused one-third of children to slip their routine vaccinations during the novel pandemic.[14]

The results of a systematic review implies that there was a decrease in the total number of vaccines managed and a subsequent drop in vaccination reporting, which resulted in children not receiving their recommended doses of routine vaccines.[15]

According to the current study's reference period, the COVID-19 pandemic had a substantial impact on child vaccination coverage during the lockdown period. The current study's findings, taken together with those from earlier studies, indicate that the current pandemic has had a negative impression on routine immunization.[16]

The Pakistan Polio Eradication Program reports that in August 2020, 60% of sewage environmental samples contained poliovirus, compared to 43% in August 2019. There has been a noticeable increase in the past year, which could cause future concerns.[17]

In Pakistan, more than 40 million kids missed out on the measles vaccine and about 50 million kids won't get a polio shot in 2020.[18] During the forced lockdowns in the province of Sindh, one out of every two kids failed to receive their regular vaccinations. Children who were unvaccinated during lockdown are more susceptible to illnesses that can be prevented by vaccination.[19]

It is crucial to comprehend the health facilities provided in rural areas because regular health services have also been disrupted in urban areas in COVID-pandemic.

Interestingly, data from various studies showed that routine immunization was disrupted less in rural than in urban areas. There could be three explanations for this observation. First off, most teaching hospitals in cities reallocated their routine medical services to COVID-19 service,[20] whereas of hospitals in rural settings continued to operate routinely. Second, parallel to urban areas, COVID-19 cases were lower in rural areas. Thirdly, in contrast to Pakistan's urban parts, the COVID-19 lockdown restrictions were not so strict in the country's rural capacities.[21, 22]

Parents were worried about the COVID-19 outbreaks and the lack of public transportation.[12] These issues played a significant role in delayed coverage of routine immunization. A cross-sectional study from Swat showed that the vaccination coverage enhanced in the later months of the lockdown, but the number of defaulters and zero-dose children increased.[23]

An article discussed the negative and positive influences of the COVID-19 pandemic on routine vaccination. Negative impacts in the form of augmented risk of vaccine-preventable diseases (VPD) epidemics in middle and low-income countries and positive effects embrace the likelihood that the requirement for a coronavirus vaccine may improve vaccination uptake in general.[24]

This single-centered study involved children between the age of 15 and 23 months. It was a study based in a hospital with a small sample range. Surveys of the local community are required. The study could be impacted by recall bias because mothers might not accurately recall the vaccinations received, their frequency, and their route.

Therefore, prompt action is required to create appropriate health education that will inform mothers and caregivers about the benefits of vaccination, a vaccination campaign, and the current COVID-19 pandemic. Brochures on vaccination and COVID-19 prevention

techniques should be distributed to the community during home visits and in medical facilities.

CONCLUSION

Vaccination coverage has greatly influenced by COVID-19 in the form of decreased percentage of completely vaccinated children and increased percentage of the defaulter, zero-dose or partially vaccinated children as compared to the pre-pandemic era.

Additionally, mothers demonstrated a poor understanding of their child's age eligibility for vaccination.

Conflict of Interest:
All authors declared no conflict of interest.

Acknowledgments:
We are thankful for Services Institute of Medical Sciences Lahore, data collectors, and supervisors.

Grant Support and Financial Disclosure:
No specific grant was taken for this research from any funding agency in the public, commercial or not-for-profit sectors.

Data Sharing Statement:
The data is available from the corresponding author upon request.

Contributors:

KKH: conception and design of the research, drafting.
HD: Statistical analysis, interpretation
FA: Acquisition of data and critical revision of the manuscript for intellectual content.

All authors approved the final version and signed the agreement to be accountable for all aspects of the work.

REFERENCES

1. Bakrania S, Chávez C, Ipince A, Rocca M, Oliver S, Stansfield C, et al. Impacts of pandemics and epidemics on child protection: Lessons learned from a rapid review in the context of COVID-19. 2020, Innocenti Working Papers, no. 2020-05, UNICEF Office of Research - Innocenti, Florence
2. Ota MOC, Badur S, Romano-Mazzotti L, Friedland LR. Impact of COVID-19 pandemic on routine immunization. Ann Med. 2021;53(1): 2286-2297.doi:10.1080/07853890.2021.2009128.
3. Alderson MR, Arkwright PD, Bai X, Black S, Borrow R, Caugant DA, et al. Surveillance and control of meningococcal disease in the COVID-19 era: A global meningococcal initiative review. J Infect. 2022; 84(3): 289-296. doi:10.1016/j.jinf.2021.11.016.
4. Rahman SU, Haq FU, Imran M, Shah A, Bibi N, Khurshid R, et al. Impact of the COVID-19 lockdown on routine vaccination in Pakistan: A hospital-based study. Hum Vaccin Immunother.2021; 17(12):4934-4940.doi:10.1080/21645515.2 021.1979 380.
5. SeyedAlinaghi S, Karimi A, Mojdeganlou H, Alilou S, Mirghaderi SP, Noori T, et al. Impact of COVID-19 pandemic on routine vaccination coverage of children and adolescents: A systematic review. Health Sci Rep. 2022; 5(2): e00516.doi:10.1002/hsr2.516
6. Sangwan G, Sharma A, Gupta M. Impact of COVID-19 pandemic on routine immunization of under-5 children. Int J Health Res. 2020; 4(1): 112-115.
7. Ota MOC, Badur S, Romano-Mazzotti L, Friedland LR. Impact of COVID-19 pandemic on routine immunization. Ann Med. 2021; 53(1):2286-2297.doi:10.1080/07853890.2021.2009128.
8. Harris RC, Chen Y, Côte P, Ardillon A, Nievera MC, Ong-Lim A, et al. Impact of COVID-19 on routine immunisation in South-East Asia and Western Pacific: Disruptions and solutions. Lancet Reg Health West Pac. 2021; doi:10:100140. doi: 10.1016/j.lan wpc.2021.100140.
9. Lapolla P, Mingoli A, Lee R. Deaths from COVID-19 in healthcare workers in Italy-What can we learn? Infect Control Hosp Epidemiol. 2021;42(3):364-365.doi:10.1017/ice.2020.241.

10. Sudharsanan N, Didzun O, Bärnighausen T, Geldsetzer P. The contribution of the age distribution of cases to covid-19 case fatality across countries: a nine-country demographic study. Ann Intern Med. 2020; 173(9): 714-720.doi:10.7326/M 20-2973.
11. Gómez-Ochoa SA, Franco OH, Rojas LZ, Raguindin PF, Roa-Díaz ZM, Wyssmann BM, et al. COVID-19 in health-care workers: A living systematic review and meta-analysis of prevalence, risk factors, clinical characteristics, and outcomes. Am J Epidemiol.2021;190(1):161-175.doi:10.109 3/aje/kwaa 191.
12. World Health Organization. Immunization coverage.\Available at: https://www.who.int /news-room/fact-sheets/detail/immunization-coverage
13. World Health Organization. Immunization data. Available at: https://immunizationdata. who.int/listing.html?topic=coverage&locati on=global. 2022
14. Almoosa Z, Alhamoud HH, Alkhalaf AB, Alabdullah WA, Alghafli JA, Albensaad MS, et al. Impact of coronavirus disease 2019 (Covid-19) pandemic on routine pediatric vaccination in eastern region, Saudi Arabia. Med Sci. 2020; 24(106): 4672-4681.
15. Lassi ZS, Naseem R, Salam RA, Siddiqui F, Das JK. The impact of the COVID-19 pandemic on immunization campaigns and programs: a systematic review. Int J Environ Res Public Health. 2021; 18(3):988.doi:10.3 390/ijerph1 8030988.
16. Pachetti M, Marini B, Giudici F, Benedetti F, Angeletti S, Ciccozzi M, et al. Impact of lockdown on Covid-19 case fatality rate and viral mutations spread in 7 countries in Europe and North America. J Transl Med. 2020; 18(1):338.doi:10.1186/s12967-020-02 501-x.
17. Nørgaard SK, Vestergaard LS, Nielsen J, Richter L, Schmid D, Bustos N, et al. Real-time monitoring shows substantial excess all-cause mortality during second wave of COVID-19 in Europe, October to December 2020. Euro Surveill. 2021; 26(2):2002023. doi:10.2807/1560-7917.ES.2021.26.1.0020 23
18. Rana MS, Ikram A, Salman M, Usman M, Umair M. Negative impact of the COVID-19 pandemic on routine childhood immunization: experience from Pakistan. Nat Rev Immunol. 2021; 21(11): 689-690. doi:10. 1038/s41577-021-00627-7.
19. Chandir S, Siddiqi DA, Mehmood M, Setayesh H, Siddique M, Mirza A, et al. Impact of COVID-19 pandemic response on uptake of routine immunizations in Sindh, Pakistan: an analysis of provincial electronic immunization registry data. Vaccine. 2020; 38(45):7146-7155.doi:10.1016/j.vaccine.20 20.08.019.
20. Abdool Karim Q, Abdool Karim SS. COVID-19 affects HIV and tuberculosis care. Science. 2020; 369(6502): 366-368. doi:10.1126/science.abd1072
21. Hogan AB, Jewell BL, Sherrard-Smith E, Vesga JF, Watson OJ, Whittaker C, et al. Potential impact of the COVID-19 pandemic on HIV, tuberculosis, and malaria in low-income and middle-income countries: a modelling study. Lancet Glob Health. 2020; 8(9): e1132-e1141.doi:10.1016/S2214-109X (20)30288-6.
22. Dorward J, Khubone T, Gate K, Ngobese H, Sookrajh Y, Mkhize S, et al. The impact of the COVID-19 lockdown on HIV care in 65 South African primary care clinics: an interrupted time series analysis. Lancet HIV. 2021; 8(3):e158-e165.doi:10.1016/S2352-30 18(20)30359-3.
23. Ullah K, Saleem J, Ishaq M, Ali Khattak F, Majeed F. Effects of the COVID-19 pandemic on the uptake of routine immunization vaccines in Swat District in Pakistan. Avicenna. 2022; 2022(2):11.doi: 10.5339/avi.2022.11
24. Ali I. Impact of COVID-19 on vaccination programs: adverse or positive? Hum Vaccin Immunother. 2020; 16(11):2594-2600.doi: 10.1080/21645515.2020.