

Association of Factors Affecting Measles Vaccine Coverage During Covid-19 Pandemic among the Children Aged 09-24 Months

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Submitted for Publication: 15-02-2022
Accepted for Publication 19-08-2023

How to Cite: Nizamani S, Rahman S, Siddiqui MI, Thebo AA, Rutba. Association of Factors Affecting Measles Vaccine Coverage During Covid-19 Pandemic among the Children Aged 09-24 Months. APMC 2023;17(4):578-583. DOI: 10.29054/APMC/2023.1463

ABSTRACT

Background: The COVID-19 pandemic has had a significant impact on public health measures, including routine childhood immunizations. Measles, a highly contagious viral infection, remains a significant public health threat, and routine vaccination against measles is critical in preventing outbreaks. **Objective:** To evaluate the immunization status and factors affecting measles vaccination for measles vaccine coverage during COVID-19 in children aged 09–24 month. **Study Design:** Descriptive cross-sectional study. **Settings:** This study was done at department of community medicine and samples were collected from Union Council -II, District Tando Muhammad Khan Sindh Pakistan. **Duration:** March 2020 to December 2020. **Methods:** All the children those who were aged 09 to 24 months, living in Tando Muhammad Khan. UC-II, District Tando Muhammad Khan, parents/guardians who consent to participate in the study and those children who were defaulter of first dose of measles vaccine were included. All parents and guardians were interviewed regarding vaccination status according to the study protocol. Data were collected using a pre-designed and pre-tested questionnaire. The principal investigator conducted the interviews and filled out the questionnaire. However, in some instances, Lady Health Workers (LHWs) were also visited to provide assistance. Additionally, the previous year's records of measles immunization in Union Council-2 Tando Muhammad Khan were obtained from the District Health Office (DHO) in District Tando Muhammad Khan. The collected information was entered into SPSS version 22.0 for analysis. **Results:** The study involved 422 cases with a mean age of 13.4 months. The study found that 98.1% of the children received routine vaccinations, but only 1.95% did not visited vaccination centers during the pandemic. The main reasons for not getting the measles vaccination were fear of COVID-19 (50.5%) and lockdown (31.85%). Socioeconomic factors, such as disease (92.2%), economic crises (80.6%), and domestic issues (37.9%), also affected vaccination coverage. Even though the most parents believed that vaccination can save their child from measles (82.7%). **Conclusion:** The outbreak of COVID-19 has significantly impacted the vaccination rates for measles. Factors such as lockdowns, transportation issues, unreachable programs, child health-related issues, and financial crises have all contributed to a decline in measles vaccination rates. Fear of COVID-19 has led to a reluctance among some parents to bring their children to healthcare facilities for routine vaccinations.

Keywords: Measles, Vaccination, Factors, Covid-19.

INTRODUCTION

The COVID-19 pandemic is causing widespread damage to both the healthcare system and other important healthcare services around the world. Vaccination is a significant contributor to the elimination of infectious diseases. On March 11th, 2020, the World Health Organization (WHO) announced that the

coronavirus (COVID-19) had triggered a worldwide pandemic. As a result of COVID-19, essential healthcare services like antenatal care and immunization were inaccessible to people that put their lives in threat in which mostly children are being affected.² Official data has been recently released by the World Health Organization (WHO) and the United Nations International Children's Emergency Fund (UNICEF). The

recently released official data indicates that in 2020, regular immunization services did not provide basic vaccines to 23 million children. This is an increase of 3.7 million from the previous year of 2019.³ According to the most recent comprehensive worldwide data on childhood immunizations, which takes into account most countries saw a decline in childhood vaccination rates in the past year due to the disruptions in services caused by the COVID-19 pandemic. These are the first official figures to reflect this trend.^{4,5} Unfortunately, a concerning number of children worldwide did not receive any vaccinations during the year, with up to 17 million affected. This situation has worsened existing inequalities in access to vaccines.⁶ Most of the children who missed out on vaccines live in areas that are affected by conflict, located in remote and underserved regions, or situated in informal or slum settings. These areas are characterized by numerous disadvantages, for instance the impacts of COVID-19 include restricted access to necessary healthcare and critical social services.⁷ Although countries are currently striving to acquire COVID-19 vaccines, they have not met their targets for other types of vaccinations, which has put children in danger of preventable but potentially fatal illnesses like measles, polio, and meningitis.⁸

Throughout all regions, there was a raised numbers of the children who did not receive important initial vaccine doses in 2020, and there were millions more who missed subsequent vaccinations. The year 2020 saw significant interruptions in immunization services, with the Southeast Asian and Eastern Mediterranean Regions of the World Health Organization (WHO) were the most affected by the impact of COVID-19.³ Due to decreased access to healthcare services and immunization outreach, In general, there was a rise in the number of children who missed their primary vaccinations. This was observed across all regions.^{3,4} The number of children who missed their first dose of the diphtheria, tetanus, and pertussis vaccine (DTP-1) increased significantly compared to the previous year (2019), with an additional 3.5 million children affected. In 2020, there was also a rise of 3 million children who did not receive their initial measles vaccine dose (MMR).⁹ Measles is a viral disease that spreads easily and has become a significant cause of death in recent times. In 2018, over 140,000 children died globally due to measles. The incidence of measles has increased significantly from 132,490 cases in 2016 to 869,770 cases in 2019. Between 2016 and 2019, the worldwide mortality rate due to measles rose by over 50%. The postponement of regular vaccines across Pakistan, which was largely influenced by the COVID-19 pandemic, has led to important outbreaks of measles in Sindh Province. The disruption of regular healthcare services and inadequate vaccination coverage has led to this situation, on Immunization the Expanded Program (EPI) has been

identified as the program with the highest susceptibility, which has led to a high incidence of illness and death under five years of age between children.¹¹ Due to a lack of sufficient vaccinations, children throughout Pakistan are in danger of developing severe illnesses that could be life-threatening. With the third highest rate of child mortality and ranking third worldwide for the largest number of children who are not fully vaccinated, Pakistan has 15% of its population under the age of five, contributing to 50% of the country's mortality rate.¹² A survey on demographic health, which was carried out from 2013 to 2018, has revealed that approximately three million children in Pakistan failed to receive necessary immunizations annually. The PDHS 2017-18 reported that around 66% of children in Pakistan who were between 12 to 23 months old had been given all of their necessary initial immunizations.¹³ Similar to other regions, Sindh also experienced significant negative impacts from the COVID-19 pandemic restrictions. The provision of vaccination services, including those for measles, was also observed to have been impacted. This has made children more vulnerable to contracting this deadly disease, which could lead to another outbreak in the province.¹⁴ Vaccination is crucial for measles immunity, but the pandemic has led to outbreaks among unvaccinated individuals. With millions of newborns born daily, the risk of missed immunizations is high, posing a public health threat. Prolonged pandemics may exacerbate illness and mortality rates, emphasizing the urgency of addressing vaccination coverage.¹⁵ However, this study aimed to identify factors influencing measles vaccination coverage during the COVID-19 pandemic. Understanding these factors can improve immunization services during future pandemics.

METHODS

This descriptive cross-sectional study was conducted at Union Council Tando Muhammad Khan-II, District Tando Muhammad Khan, Sindh, Pakistan. The study was carried out over a period of six months after obtaining ethical approval from the Ethical Review Committee of Liaquat University of Medical and Health Sciences (LUMHS). The study included children aged 9 to 24 months between March 2020 and December 2020, residing in Tando Muhammad Khan UC-II, District Tando Muhammad Khan, whose parents/guardians provided consent for participation, and those children who were defaulters of the first dose of the measles vaccine. Children below the age of 9 months and above 24 months, those with medical conditions compromising their health, and those who had received their first dose of the measles vaccine but were defaulters of the second dose were excluded from the study. The study population consisted of parents or guardians of children aged 9–24 months residing in the selected area. Data were collected

using a structured questionnaire administered through face-to-face interviews, depending on the prevailing COVID-19 situation and safety protocols. The questionnaire gathered information on demographic characteristics, immunization history, practices, and influencing factors related to measles vaccination. The questionnaire was pre-designed and pre-tested for validity, with assistance sought from a senior researcher/epidemiologist. Written informed consent was obtained from each respondent, and they were assured that all their information would be kept confidential and used solely for research purposes. The principal investigator conducted the interviews and completed the questionnaire, with potential assistance from Lady Health Workers (LHWs). Additionally, the previous year's records of measles immunization in Union Council-2 Tando Muhammad Khan were obtained from the District Health Office (DHO) in District Tando Muhammad Khan. The collected data were entered into SPSS version 22.0 for analysis.

RESULTS

A total of 422 cases were included in the study to assess factors affecting measles vaccination coverage in children aged 9 to 24 months during the COVID-19 pandemic. The mean age of the children was 13.40 ± 2.49 months, ranging from 9 to 22 months. Among the participants, 52.1% were male and 47.9% were female. Regarding parental and guardian occupational status, 47.9% were laborers, 10.0% were shopkeepers, 30.3% were housewives, 4.0% were teachers, 4.3% were drivers, 2.6% owned businesses, and 0.9% were tailors. In terms of education, the majority of parents (58.3%) were uneducated, 20.15% had primary level education, and the rest had education up to metric or higher. Socioeconomic status varied, with 58.1% having a middle socioeconomic status, 22.0% classified as poor, and only 19.9% categorized as having upper socioeconomic status. Family structure revealed that 43.8% of cases were from nuclear families, 46.2% from joint families, and 10.0% from extended families. Additional information on religion and the number of children in each family is presented in table 1.

Most of the respondents (98.1%) reported that their children received routine vaccinations, while 1.2% stated otherwise, and 0.7% were uncertain. Only 1.95 cases visited vaccination centers during the COVID-19 pandemic. Among them, 38.4% indicated that vaccinations were available at the centers, while the rest were unsure. Additionally, 1.9% of cases mentioned that vaccinations were administered at their homes. Regarding reasons for not getting the measles vaccination, 50.5% of cases cited fear of COVID-19, 31.85% mentioned lockdown restrictions, 15.9% reported transportation issues, and 1.9% cited unreachable programs. Some parents refused vaccination due to child

health issues such as fever and diarrhea. In terms of socioeconomic factors, 21.3% of cases postponed their child's measles vaccination due to financial constraints, and 37.9% stated that vaccination was affected by domestic issues. Table 2

Table 1: Demographic information of the study participants (n=422)

| Variable | Frequency | Percent | |
|---|--------------|---------|-------|
| Gender of children | Male | 220 | 52.1% |
| | Female | 202 | 47.9% |
| Respondents | Father | 175 | 41.5% |
| | Mother | 242 | 57.3% |
| | Guardians | 05 | 01.2% |
| Occupational status of the parents | Labour | 202 | 47.9% |
| | Shop keeper | 42 | 10.0% |
| | House wife | 128 | 30.3% |
| | Teacher | 17 | 4.0% |
| | Driver | 18 | 4.3% |
| | Own business | 11 | 2.6% |
| Educational status of the parents | Illiterate | 246 | 58.3% |
| | Primary | 85 | 20.1% |
| | Middle | 30 | 07.1% |
| | Matric | 29 | 06.9% |
| | Above | 32 | 07.6% |
| Socioeconomic status | Poor | 93 | 22.0% |
| | Middle | 245 | 58.1% |
| | Upper | 84 | 19.9% |
| Family status | Nuclear | 185 | 43.8% |
| | Joint family | 195 | 46.2% |
| | Extended | 42 | 10.0% |
| Religion | Islam | 226 | 53.6% |
| | Hinduism | 172 | 40.8% |
| | Christianity | 18 | 04.3% |
| | Other | 06 | 01.4% |
| Number of the children | 1-3 | 244 | 57.8% |
| | 4-6 | 146 | 34.6% |
| | >6 | 32 | 07.6% |
| Children affected from measles during the time period of Covid-19 | Yes | 7 | 1.7 |
| | No | 415 | 98.3 |

In accordance to the personal opinions, 79.4% had idea that the vaccination not considered as an important factor

for child, while 82.7% believed that the vaccination can save their child from measles disease. Table 3

Table 2: Factors affecting measles vaccine coverage (n=422)

| Variable | Frequency | Percent | |
|--|-----------------------------------|---------|------|
| Did the child have other routine vaccination? | Yes | 414 | 98.1 |
| | No | 5 | 1.2 |
| | Don't know | 3 | .7 |
| If yes what is the status of child's routine vaccination? | Complete | 17 | 4.0 |
| | Partial | 390 | 92.4 |
| | Defaulter/ Not vaccinated | 11 | 2.6 |
| | Don't know | 4 | .9 |
| Have you visited vaccination center during COVID-19 lockdown? | Yes | 8 | 1.9 |
| | No | 409 | 96.9 |
| | Don't know | 5 | 1.2 |
| Vaccinators were available at vaccination center during COVID-19 lockdown? | Yes | 8 | 1.9 |
| | No | 162 | 38.4 |
| | Don't know | 252 | 59.7 |
| Did the vaccinators provide home delivery services during COVID-19 lockdown? | Yes | 8 | 1.9 |
| | No | 119 | 28.2 |
| | Don't know | 295 | 69.9 |
| What were the reasons for not getting the measles vaccination? | lockdown | 134 | 31.8 |
| | fear of contact of covid 19 virus | 213 | 50.5 |
| | Due to transportation problem | 67 | 15.9 |
| | Suspension of outreach program | 8 | 1.9 |
| | Financial crises during lockdown | 90 | 21.3 |
| | Due to the domestic issue | 160 | 37.9 |

Table 3: Parental personal attitude regarding vaccination (n=422)

| Variable | Frequency | Percent | |
|---|------------|---------|------|
| Was vaccination not considered as an important factor for child in your personal opinion? | Yes | 335 | 79.4 |
| | No | 18 | 4.3 |
| | Don't know | 69 | 16.4 |
| Do you know vaccination can save the child from measles disease? | Yes | 349 | 82.7 |
| | No | 7 | 1.7 |
| | Don't know | 66 | 15.6 |

DISCUSSION

Measles vaccination is one of the most critical interventions to reduce morbidity and mortality rates among children worldwide. However, the COVID-19 pandemic has significantly impacted the delivery and uptake of measles vaccination, with several factors affecting the immunization coverage rates. This study aimed to investigate the factors influencing measles vaccination coverage during the COVID-19 pandemic and propose potential solutions. A total of 422 cases were analyzed to assess measles vaccination coverage among children aged 9 to 24 months during the pandemic. The mean age of the children in our study was 13.40 ± 2.49 months, with 52.1% being male and 48.9% female. A comparison with previous studies reveals some differences in findings. Miretu DG et al,¹⁶ conducted a study on the impact of the COVID-19 pandemic on vaccination rates among children aged 15–23 months. They reported a mean age of 18.4 months, with 50.8% females and 49.2% males. Similarly, Gelagay AA et al¹⁷ investigated measles vaccination coverage among 857 children. Their study found that 50.3% of the sample were girls, with an average age of 18.15 ± 3.91 months. These comparisons highlight some variations in age distribution and gender representation across studies, which may be influenced by factors such as geographic location and difference in the sample size of the studies.

In this study the COVID-19 pandemic has led to the imposition of lockdowns and movement restrictions in many countries worldwide. These measures have disrupted the delivery of routine immunization services, including measles vaccination. A study conducted in Ethiopia found that the proportion of children who received the measles vaccine dropped significantly during the COVID-19 pandemic due to the disruption of routine immunization services caused by lockdowns and movement restrictions.¹ Similarly, a study in Pakistan found that measles vaccination coverage rates declined significantly during the COVID-19 pandemic, with lockdowns and movement restrictions being identified as the primary drivers of the decline.² Parents and caregivers may have concerns about exposing their children to COVID-19 when taking them for routine immunization services, including measles vaccination. This fear can lead to reduced demand for vaccination services and, consequently, a decline in measles vaccination coverage rates. A study conducted in Nigeria found that parents' fear of COVID-19 infection was one of the primary reasons for the decline in measles vaccination coverage rates during the pandemic.³ Similarly, a study in Pakistan found that parents' concerns about COVID-19

exposure were a significant factor in the decline in measles vaccination coverage rates during the pandemic (2). The COVID-19 pandemic has disrupted immunization services worldwide, leading to the suspension of routine immunization services and the reassignment of healthcare workers to COVID-19-related activities. This disruption has resulted in reduced access to measles vaccination services, particularly in low- and middle-income countries. A study conducted in Indonesia found that the disruption of immunization services due to the COVID-19 pandemic was a significant factor in the decline in measles vaccination coverage rates.⁴ Similarly, a study in Pakistan found that the disruption of immunization services due to the pandemic led to a decline in measles vaccination coverage rates.² The COVID-19 pandemic has overwhelmed healthcare systems worldwide, leading to reduced health facility capacity. Many health workers have been redeployed to manage COVID-19 cases, resulting in a shortage of healthcare personnel for routine immunization. In addition, some health facilities have been converted to COVID-19 treatment centers, leading to a reduction in the availability of routine immunization services.

The COVID-19 pandemic has led to significant economic disruptions worldwide, with many households facing financial constraints. These constraints can make it challenging for families to access measles vaccination services, particularly in low- and middle-income countries. A study conducted in Nepal found that the economic impact of the pandemic was a significant factor in the decline in measles vaccination coverage rates (5). Similarly, a study in Pakistan found that financial constraints were a significant barrier to accessing measles vaccination services during the pandemic (2). To address these factors, several measures can be taken. First, governments and international organizations should prioritize the delivery of routine immunization services, including measles vaccination, during the COVID-19 pandemic. This includes ensuring that health facilities remain open, healthcare workers are adequately trained and equipped, and transport services are available to reach communities. Second, innovative solutions such as mobile clinics and outreach services can be used to reach communities that are difficult to access. Health education campaigns can also be used to address the concerns of parents and dispel misinformation about the safety and effectiveness of vaccines. Third, financial support can be provided to families who are struggling due to the economic impact of the pandemic. This can include subsidies for transportation and vaccines or cash transfers to support household incomes.

CONCLUSION

The outbreak of COVID-19 has significantly impacted the vaccination rates for measles. Factors such as lockdowns,

transportation issues, unreachable programs, child health-related issues, and financial crises have all contributed to a decline in measles vaccination rates. Fear of COVID-19 has led to a reluctance among some parents to bring their children to healthcare facilities for routine vaccinations.

LIMITATIONS

This study is limited by a small sample size, primarily consisting of individuals from rural areas. Limited awareness and low literacy rates may have contributed to hesitancy in seeking information and ignorance regarding vaccinations for their children. Additionally, many parents lacked precise knowledge about vaccinations, resulting in hesitant and uncertain responses during data collection.

SUGGESTIONS / RECOMMENDATIONS

It's crucial for healthcare providers and policymakers to tackle these barriers to ensure children receive routine vaccinations, like measles shots. This helps prevent outbreaks of preventable diseases, safeguarding vulnerable populations, especially children. Increasing public awareness about vaccine importance and addressing pandemic safety concerns in healthcare settings can ease parental fears and boost vaccination rates. The united efforts among healthcare providers, policymakers, and the public are essential to overcome pandemic challenges and maintain high vaccination rates.

CONFLICT OF INTEREST / DISCLOSURE

None.

ACKNOWLEDGEMENTS

Authors would like to extend our sincere gratitude to our fellows and supervisor for their invaluable support and guidance throughout the completion of this research work. Authors are also immensely thankful to all the study participants for their active participation and cooperation, which made this research possible. Special thanks are also due to the dedicated Lady Health Workers who assisted in data collection.

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