Biological and Clinical Sciences Research Journal
eISSN: 2708-2261; pISSN: 2958-4728
www.bcsrj.com
DOI: https://doi.org/10.54112/bcsrj.v6i4.1661
*Biol. Clin. Sci. Res. J., Volume 6(4), **2025**: 1661*
Original Research Article

Immunization Status of Children Admitted With Measles in a Tertiary Care Hospital

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(Received, 24th January 2025, Accepted 12th April 2025, Published 30st April 2025)

Abstract: *Measles continues to pose a pervasive threat in pediatric healthcare, as it not only has a high rate of transmissibility but also has the potential to lead to severe complications such as pneumonia and encephalitis.* ***Objective:*** *To determine the immunization status of children presenting with measles at a tertiary care hospital.* ***Methods:*** *This Cross-Sectional study design was conducted at the Dept of Pediatrics – Patel Hospital, Karachi, during July 2024 to December 2024. Ethical approval was secured from the Institutional Review Board of the designated tertiary care hospital before data collection began. Pediatric patients admitted with measles were identified and enrolled as study participants after obtaining informed consent from their guardians or parents. Data were gathered using a structured questionnaire designed to capture sociodemographic details, disease history, clinical symptoms, and immunization status.* ***Results:*** *Data were collected from 261 children with a majority being male (59.77%). The mean age was 4.6 years (±2.3). Socioeconomic distribution showed that most participants belonged to low-income families (65%), while middle-income (22%) and high-income (13%) families had lower representation. Regarding parental education, 58% of parents had no formal education, 27% had primary education, and only 15% had secondary or higher education, highlighting educational disparities among the participants' families.* ***Conclusion:*** *It is concluded that immunization plays a critical role in preventing measles and reducing its complications, with fully vaccinated children experiencing significantly lower rates of severe outcomes compared to unvaccinated ones.*

Keywords: Measles Immunization Pediatrics, Vaccination Coverage, Socioeconomic Factors

[***How to Cite:*** Haider A, Humayun K, Moiz S, Ali R, Mujeeb H, Ali F. Immunization status of children admitted with measles in a tertiary care hospital. *Biol. Clin. Sci. Res. J.*, **2025;** 6(4): 40-43. doi: https://doi.org/10.54112/bcsrj.v6i4.1661

Introduction

Measles continues to pose a pervasive threat in pediatric healthcare, as it not only has a high rate of transmissibility but also has the potential to lead to severe complications such as pneumonia and encephalitis (1,3). Aurangzeb et al. explicitly discussed the risk factors for mortality in children with complicated measles, highlighting the dire need for focused intervention (1). Despite worldwide progress in vaccination programs aiming for regional measles elimination (4), recurrent measles episodes continue challenging tertiary healthcare settings (5). These advanced healthcare facilities serve as critical nodes in the healthcare system, dealing with complex and severe medical conditions. The necessity of evaluating the immunization status among pediatric patients admitted with measles in these tertiary settings is compelling for several reasons. A study by Muhammad et al. found that complications arising from measles were notably lower in vaccinated children than their non-vaccinated counterparts. This finding alone may reveal gaps in vaccination strategies and healthcare delivery mechanisms (6). Furthermore, Dixon et al. discussed progress in regional measles elimination, suggesting that data from tertiary settings could inform broader policy initiatives (7).

The primary objective of this research is an in-depth scrutiny of immunization status among pediatric patients admitted with measles in a tertiary healthcare facility. The study aims to quantify complete, partial, or absent immunization levels and examine any existing correlation between the severity of measles symptoms and immunization status (8). It will also look into various demographic factors such as age, sex, and geographical locale, as evidenced by Rana et al., who examined the emergence of measles during the COVID-19 pandemic in Pakistan and found that demographic variables had a considerable impact on the disease burden (9).

The anticipated outcomes of this research are multifaceted and of broad application. Clinicians stand to gain valuable insights for modifying existing vaccination protocols (10). Moreover, health policymakers may use the information for strategic planning and reformation of existing health policies, a critical need also underscored by Thakkar et al., who highlighted the importance of optimizing the timing of vaccination campaigns. The World Health Organization has warned of a "perfect storm" of conditions for measles outbreaks, emphasizing the urgency of strategic policy planning (11).

Globally in 2016-17, the number of measles-affected cases was 7 million and 6.7 million, with a death rate of 90000 and 110000, respectively (1,8). In 2018, under-5 mortality related to measles was 140000 (9). Major outbreaks ensue worldwide in 2019-2020, as more than 120 million children did not receive vaccination due to the COVID-19 pandemic, reaching 869770 infective cases, claiming 207500 lives, being the highest number of cases reported since 1996. In 2022, the number of affected cases outweighed that of 2021, 17338, which was 9665 previously (10). About 37-58% of children in Pakistan are incompletely vaccinated, as vaccine coverage is below 60% (5, 11). In 2021, Pakistan was among the top five countries with the greatest number of unvaccinated children against measles, with 79 notified outbreaks, 8,054 confirmed cases, and 47 deaths since 2021 (2).

Furthermore, this research aims to serve as a crucial educational resource for caregivers and parents, emphasizing the importance of timely and complete vaccination to prevent severe outcomes and complications (12). Finally, this study aims to contribute foundational data for future academic inquiries, thereby supporting a comprehensive understanding of vaccine efficacy and healthcare system effectiveness (13).

Thus, the study aimed to determine the immunization status of children presenting with measles at a tertiary care hospital.

Methodology

This Cross-Sectional study design was conducted at the Dept of Pediatrics – Patel Hospital, Karachi, from July 2024 to December 2024. A total of

261 cases were studied. The sample size was calculated using OpenEpi, Version 3, and a parent article was used to estimate the frequency of immunization status among children with measles. Non-probability consecutive sampling was used to select the participants. Children aged 15 months to 12 years who were clinically diagnosed with measles and admitted to the designated tertiary care hospital during the study period were included. Only cases with complete medical records containing vaccination histories or immunization details were eligible. Additionally, participation was contingent on obtaining written informed consent from parents or legal guardians. Children below 15 months or above 12 years of age, those admitted for conditions other than measles, and cases with incomplete or unavailable medical records were excluded. Parents or guardians who refused to provide informed consent also excluded their children. Furthermore, children with immunodeficiency diseases or undergoing immunosuppressive therapy and those already included in similar studies were not eligible to participate. Ethical approval was secured from the Institutional Review Board at the designated tertiary care hospital before data collection. Pediatric patients admitted with measles were enrolled as study participants from this hospital's Pediatrics Department, with informed consent obtained from guardians or parents. A rigorously designed questionnaire was the data collection tool, capturing sociodemographic variables, disease history, clinical symptoms, and immunization status. Data were collected via structured interviews conducted by trained healthcare professionals and corroborated by medical record reviews. Unique alphanumeric identifiers replaced personal information to ensure confidentiality, and all data were encrypted and password-protected. The data were retained securely for a specified duration post-study before secure disposal. Data analysis was conducted using SPSS v. 22.0 and Microsoft Excel 2016. Data normality was assessed via the Shapiro-Wilk test. Categorical variables like gender and immunization status were analyzed using Chi-square tests, while continuous variables such as age and illness duration were summarized as mean ± SD. Statistical significance was set at $P \leq 0.05$, with $P \leq 0.001$ considered highly significant. This approach aligned with the study's objectives and ensured methodological rigor.

Results

Data were collected from 261 children, mostly male (59.77%). The mean age was 4.6 years (±2.3). Socioeconomic distribution showed that most participants belonged to low-income families (65%), while middle-income (22%) and high-income (13%) families had lower representation. Regarding parental education, 58% of parents had no formal education, 27% had primary education, and only 15% had secondary or higher education, highlighting educational disparities among the participants' families. The immunization status of the children in the study showed that 41.37% (108) were fully vaccinated, indicating that less than half of the population adhered to the recommended vaccination schedule. A significant proportion, 36.01% (94 children), were partially vaccinated, suggesting gaps in completing the immunization series. Additionally, 22.6% (59 children) were completely unvaccinated, reflecting substantial barriers to vaccine access or acceptance. The study revealed that 65.1% (176 cases) of children with measles did not develop complications, indicating that most cases were relatively mild. However, 22.2% (58 cases) experienced pneumonia, making it the most common complication. Diarrhea was reported in 8.8% (23 cases), while encephalitis, a severe and potentially life-threatening condition, occurred in 3.83% (10 cases). Among fully vaccinated children, only 8.8% experienced complications, and their mean illness duration was the shortest at 6.3 ± 1.8 days. Partially vaccinated children had a higher complication rate of 28.7%, with a longer illness duration averaging 7.5 ± 2.1 days. Unvaccinated children faced the highest complication rate at 67.8%, and their mean illness duration was the longest, at 9.2 ± 2.5 days. The most common barrier was a lack of awareness, reported in 40.7% of cases, indicating that many caregivers were unaware of vaccination schedules or the importance of vaccines. Logistical challenges, such as access to healthcare facilities and transportation issues, accounted for 32.2% of cases. Vaccine hesitancy, driven by fears or misconceptions about vaccine safety and efficacy, was noted in 27.1% of cases. Fully vaccinated children comprised 42.7% of the participants and had the lowest complication rate (8.8%) with a mean illness duration of 6.3 ± 1.8 days, highlighting the protective benefits of complete immunization. Partially vaccinated children accounted for 35.2% of the group, with a higher complication rate of 28.7% and a slightly longer illness duration of 7.5 ± 2.1 days, reflecting the reduced effectiveness of incomplete vaccination.

Table 1: Socio-Demographic Characteristics of the Study Population (N = 261)

Characteristic	Value
Gender	
Male	59.77% (156)
Female	40.23% (105)
Age	
Mean Age (years)	4.6 ± 2.3
Household Income Level	
Low-Income Families	65% (169)
Middle-Income Families	22% (58)
High-Income Families	13% (34)
Parental Education Level	
Parents with No Education	58% (151)
Parents with Primary Education	27% (71)
Parents with Secondary+ Education	15% (39)

Table 2: Immunization Status

Status	Percentage	Count
Fully Vaccinated	41.37%	108
Partially Vaccinated	36.01%	94
Unvaccinated	22.6%	59

Table 3: Clinical Presentation and Complications

Complications	Count	Percentage
No Complications	170	65.1%
Pneumonia	58	22.2%
Diarrhea	23	8.8%
Encephalitis	10	3.83%

Table 4: Association between Immunization and Severity

Immunization Status	Complications (%)	Mean Illness Duration (days)
Fully Vaccinated	8.8%	6.3 ± 1.8
Partially Vaccinated	28.7%	7.5 ± 2.1
Unvaccinated	67.8%	9.2 ± 2.5
Contact History	Percentage	Count
Contact with a Measles Patient	45.2%	118
Contact with a Known Carrier	30.1%	78
No Known Contact with Infected Individuals	24.7%	65

Table 5: Barriers to Vaccination

Barrier	Percentage
Lack of Awareness	40.7%
Vaccine Hesitancy	27.1%
Logistical Challenges	32.2%

Table 6: Trends in Immunization Status

Immunization Status	Percentage	Complications (%)	Mean Illness Duration (days)
Fully Vaccinated	42.7%	8.8%	6.3 ± 1.8
Partially Vaccinated	35.2%	28.7%	7.5 ± 2.1
Unvaccinated	22.1%	67.8%	9.2 ± 2.5

Discussion

This study highlighted significant insights into the immunization status of children presenting with measles, emphasizing the critical role of vaccination in reducing disease severity and complications. They found from the study that 42.7 percent of children were vaccinated fully, 35.2 percent were partially vaccinated, but 22.1 percent of children were unvaccinated. Children who did not receive any vaccine developed complications at 67.8% compared to fully vaccinated children, who developed complications at 8.8%; the sickness persisted longer in unvaccinated children (14). This study demonstrates the strong intensity of complete immunization and the necessity to protect vaccinated persons to avoid severe measles manifestations. The survey revealed the following constraints: lack of awareness of vaccines (preferred reason – 40.7%); practical difficulties (second preferred reason – 32.2%); and reluctance to be vaccinated (third preferred reason – 27.1%). As caregivers show, a lack of awareness of vaccination schedules or their significance stresses the need for strong information, communication, and education campaigns. At the same time, system barriers indicate a need to address existing facility and geographic barriers to health access in incomplete physical health markets (15). Some members of society are reluctant to immunize their children and take preventive measures because of certain cultural beliefs and fear. This is why explaining, building a rapport, and providing adequate information to these populations becomes extremely crucial. Sociodemographic factors were therefore found to influence immunization status (16) directly. Socioeconomic differences were apparent regarding vaccination, with kids of parents from low-income households and those from less-educated parents being partially or not vaccinated. The study also revealed that children who had never taken the vaccine were more prone to serious symptoms like pneumonia (21.7%) and encephalitis (3.7%), putting a heavy strain on the facilities (17). This further proves that vaccines must be administered during the correct time to prevent extremely lethal consequences or demographically excessive usage of healthcare services. These are important findings for public health. Working on the described barriers and enhancing access to vaccines are the keys to combating measles and its consequences. The abovementioned myths can also be alleviated, and public trust increased through correct and open information. Again, success in following up the partially vaccinated children and reaching out to the targeted regions can enable the immunization program to increase coverage (18). Nevertheless, the present study has some weaknesses, such as a relatively small sample size and the study being carried out at a single tertiary care hospital; thus, the generalization of the results may be difficult. Non-propensity sampling might increase the selection bias, while the caregivers' account of the vaccination history of their ward may not be very objective (19). However, the study focuses on the measles vaccination and gives directions for future, more effective, and individualized immunization promotion. Large and diverse studies should be conducted in the future to support these conclusions and to provide relevant directions for policy changes.

Conclusion

It is concluded that immunization plays a critical role in preventing measles and reducing its complications, with fully vaccinated children experiencing significantly lower rates of severe outcomes compared to unvaccinated ones. Barriers such as lack of awareness, logistical challenges, and vaccine hesitancy contribute to gaps in vaccination coverage, particularly in low-income and underserved populations. Addressing these barriers through targeted education, improved healthcare access, and trust-building initiatives is essential for enhancing vaccination rates and achieving measles control.

Declarations

Data Availability statement
All data generated or analysed during the study are included in the manuscript.
Ethics approval and consent to participate
Approved by the department concerned. (IRBEC-PHKK-0388-23)
Consent for publication
Approved
Funding
Not applicable

Conflict of interest

The authors declared the absence of a conflict of interest.

Author Contribution

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All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the integrity of the study.

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