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ORIGINAL ARTICLE

Immunization Status, Complications, and Outcome in Children Admitted with Measles at a Tertiary Care Hospital

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ABSTRACT

Background: Measles is a contagious viral infection that impacts children globally, especially in regions with inadequate vaccination rates. Even though it can be prevented with routine immunization, outbreaks and life-threatening complications are still quite common in several developing countries. This study examines the immunization history, the complications, and the clinical outcomes of children diagnosed with measles who were admitted to a tertiary care hospital.

Methods: A one-year retrospective descriptive cross-sectional study was carried out from January 2022 till January 2023 at Department of Pediatric Medicine, Multan Medical & Dental College / Ibn-e-Siena Hospital and Research Institute, Multan. The study reviewed medical records from about 1 month to 12 years of age that were clinically diagnosed with measles. Information pertaining to demographic details, nutrition, history of immunization, any related complications, ICU stays, and overall outcomes were retrieved and treated with descriptive and inferential statistics.

Results: The study included a sample of 104 children. Measles caseload immunization was as low as 40.4%, with 29.8% partially immunized and an additional 29.8% completely unimmunized. The highest complications were pneumonia (39.4%) followed by diarrhea (28.8%). Cases which required ICU care was 20.2% of the overall caseload. There was a 14.4% mortality rate in the cohort, with the highest deaths occurring amongst children who were non-immunized. Significant statistical correlation was found to exist between immunization status with pneumonia ($p = 0.036$), diarrhea ($p = 0.045$), and overall outcome ($p = 0.014$).

Conclusion: The results emphasize the potent link between incomplete immunization and adverse clinical outcomes among children suffering from measles. Complication and mortality rates associated with measles continue to necessitate widespread vaccination as well as prompt identification and intervention for high-risk patients.

Keywords: Measles, Immunization, Children, Complications, Outcomes, Hospitalization, Pneumonia, Vaccine Coverage.

INTRODUCTION

Measles is one of the viral diseases children can get which is highly contagious and can infect a range of individuals even after an effective vaccine has been made. It starts with symptoms such as fever, cough and conjunctivitis which can develop into potentially complex issues such as pneumonia and encephalitis. These issues are especially dangerous for younger kids who are malnourished, unvaccinated, or not getting the necessary healthcare. The virus leading to measles is from the paramyxovirus family and spreads through respiratory droplets[1,2].

Through the implementation of immunization programs, the world has taken great strides towards the elimination of measles. This is, however, not the case for outbreaks which continue to occur in areas of low vaccination. Many low and middle income countries suffer from gaps in routine immunization, misinformation, and difficulties in access to healthcare which aids in the spread of the virus. For this reason, measles continues to be a significant public health concern in outbreaks[3,4].

Similar to some other countries in South Asia, Pakistan continues to experience recurrent outbreaks of measles, particularly in children below the age of five years. The persistent problems related to prevention stems from low rates of vaccination due to incomplete immunization, logistical challenges in the delivery of vaccines, and sociocultural impediments. In spite of EPI framework policies, the measles vaccination has been incorporated into the Expanded Program on Immunization (EPI) - many children are not adequately protected due to missed and/or immunization schedules that are not optimal[5,6].

Measles hospitalization case clinical patterns, complications, and outcomes must be understood to mitigate public health measures. Associations between immunization status and disease severity can enhance immunization programs and avert morbidity and mortality[7,8].

This study was therefore conducted to evaluate the immunization status, common complications, and outcomes among children admitted with measles at a tertiary care hospital. The findings aim to provide insights into the current gaps in immunization and to support data-driven approaches to improving child health outcomes in similar healthcare settings.

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METHODOLOGY

This particular study was conducted as a retrospective descriptive cross-sectional analysis focused on understanding the complete immunization history, associated complications, and clinical outcomes in children hospitalized with measles. It was carried out using the available patient records in a tertiary care hospital. The study location was Department of Pediatric Medicine, Multan Medical & Dental College / Ibn-e-Siena Hospital and Research Institute, Multan and the study period was one year, from January 2022 to January 2023. Any children that were hospitalized in this timeframe with clinically confirmed measles infection were assessed for inclusion. The diagnosis was based on the clinical picture of fever and generalized maculopapular rash and one or more of the following: cough, coryza, or conjunctivitis as documented in their hospital charts.

The study population included children between the ages of one month and twelve years. Records were included only if they contained complete documentation, including immunization history, clinical course, and final outcome. Cases with incomplete records or unclear diagnoses were excluded from the analysis.

Data were collected through a structured review of admission notes, progress sheets, discharge summaries, and immunization cards when available. Information gathered included demographic details such as age, gender, residential status (urban or rural), and nutritional classification. Immunization status for measles was categorized into fully immunized (received both recommended doses), partially immunized (received one dose), and not immunized (no vaccine received or no record available).

Clinical data included the presence of complications such as pneumonia, diarrhea, otitis media, encephalitis, and sepsis. Additional variables such as ICU admission and length of hospital stay were also noted. Outcomes were categorized as recovered, discharged with complications, or death. Nutritional status was

evaluated using recorded weight and age data, interpreted according to WHO growth standards.

Data were entered and analyzed using a statistical software package (such as SPSS version 25). Frequencies and percentages were calculated for categorical variables, while continuous variables were summarized using means or medians as appropriate. The chi-square test was used to determine associations between immunization status and both complications and outcomes. A p-value of less than 0.05 was considered statistically significant.

RESULT

Among the 104 children admitted with measles, the majority were under five years of age. Specifically, 32 (30.8%) were infants under 1 year, 38 (36.5%) were between 1 to 5 years, and 34 (32.7%) were over 5 years. Males slightly outnumbered females with 56 (53.8%) male and 48 (46.2%) female children. The study population had an almost even split between urban and rural backgrounds, with 53 (51%) children residing in urban areas and 51 (49%) from rural locations. Regarding nutritional status, 38 (36.5%) were well-nourished, 34 (32.7%) had moderate malnutrition, and 32 (30.8%) had severe malnutrition.

Out of the total children admitted, only 42 (40.4%) were fully immunized against measles as per the national schedule. Meanwhile, 31 children (29.8%) had received partial immunization, and the same number (29.8%) had not been vaccinated at all. These findings highlight a substantial proportion of children either missed or did not complete their measles vaccination, which may have contributed to the disease burden.

The most commonly observed complication among admitted cases was pneumonia, affecting 41 children (39.4%). Diarrhea followed, found in 30 (28.8%) cases. Sepsis was reported in 22 children (21.2%), while otitis media and encephalitis were identified in 17 (16.3%) and 9 (8.7%) cases, respectively. These findings indicate that measles is frequently associated with serious complications, particularly respiratory and gastrointestinal infections, further burdening clinical management.

Out of the total, 21 children (20.2%) required ICU admission, indicating a considerable proportion of severe cases. The remaining 83 (79.8%) were managed in general pediatric wards. Regarding outcomes, 71 children (68.3%) recovered without any residual issues. However, 18 children (17.3%) were discharged with complications, and 15 (14.4%) unfortunately succumbed to the illness. These numbers underscore the potentially fatal nature of measles and the critical need for effective preventive strategies.

Statistical analysis showed significant associations between immunization status and certain complications. Pneumonia ($p = 0.036$) and diarrhea ($p = 0.045$) were more common among partially or non-immunized children. No significant association was observed with otitis media, encephalitis, or sepsis. The outcome analysis revealed a significant link between immunization status and mortality ($p = 0.014$). Deaths were more frequent in the non-immunized group, while the recovery rate was highest among fully immunized children. These findings suggest that immunization provides meaningful protection against both complications and death due to measles.

Table 1: Demographic Characteristics of Children with Measles (n = 104)

Variable	Category	Frequency (n)	Percentage (%)
Age Group	<1 year	32	30.8%
	1–5 years	38	36.5%
	>5 years	34	32.7%
Gender	Male	56	53.8%
	Female	48	46.2%
Residence	Urban	53	51.0%
	Rural	51	49.0%
Nutritional Status	Normal	38	36.5%
	Moderate Malnutrition	34	32.7%
	Severe Malnutrition	32	30.8%

Table 2: Immunization Status of Children with Measles

Immunization Status	Frequency (n)	Percentage (%)
Fully Immunized	42	40.4%
Partially Immunized	31	29.8%
Not Immunized	31	29.8%

Table 3: Clinical Complications in Children with Measles

Complication	Number of Cases (n)	Percentage (%)
Pneumonia	41	39.4%
Diarrhea	30	28.8%
Otitis Media	17	16.3%
Encephalitis	9	8.7%
Sepsis	22	21.2%

Table 4: ICU Admission and Clinical Outcomes

Variable	Category	Frequency (n)	Percentage (%)
ICU Admission	Yes	21	20.2%
	No	83	79.8%
Clinical Outcome	Recovered	71	68.3%
	Discharged with Complications	18	17.3%
	Death	15	14.4%

Table 5: Association of Immunization Status with Complications and Outcome (n = 104)

Variable	Immunization Status	Yes (n)	No (n)	p-value
Pneumonia	Fully Immunized	12	30	0.036
	Partially Immunized	14	17	
	Not Immunized	15	16	
Diarrhea	Fully Immunized	9	33	0.045
	Partially Immunized	10	21	
	Not Immunized	11	20	
Otitis Media	Fully Immunized	4	38	0.238
	Partially Immunized	6	25	
	Not Immunized	7	24	
Encephalitis	Fully Immunized	1	41	0.172
	Partially Immunized	3	28	
	Not Immunized	5	26	
Sepsis	Fully Immunized	6	36	0.084
	Partially Immunized	7	24	
	Not Immunized	9	22	
Outcome: Death	Fully Immunized	3	39	0.014
	Partially Immunized	3	28	
	Not Immunized	9	22	

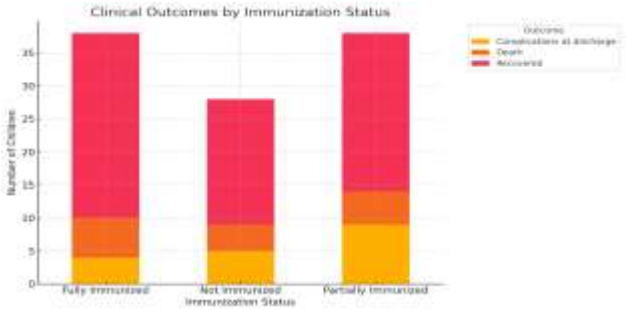

Figure 1: The bar chart demonstrates the clinical outcomes of children suffering from measles relative to their immunization status. Fully immunized children experienced the highest recovery rates along with the lowest complications and deaths. In contrast, non-immunized children experienced the highest mortality rates alongside the greatest proportion of complications at discharge. Partially immunized children fell somewhere between these two extremes. This graphic evidence strongly reaffirms the important protective effect of measles vaccination for reducing the severity of the disease and improving the clinical outcomes.

DISCUSSION

This study assessed the immunization status, clinical complications, and outcomes among children admitted with measles over a one-year period. The findings emphasize the ongoing burden of measles and highlight critical gaps in vaccine coverage.

An important observation was that almost 60% of children were either partially immunized or not immunized at all. This is worrisome considering measles is a vaccine-preventable disease, and widespread immunization has historically reduced morbidity and mortality. The result showing that only 40.4% of children in this study were fully vaccinated indicates lost chances for primary prevention and suggests underlying difficulties with vaccine hesitancy, access, or health education. These findings are consistent with other studies conducted in developing countries where there is persistent sub-optimial immunization coverage contributing to recurrent outbreaks[9-11].

Injuries were prominent among patients, especially children with inadequate vaccinations. The most common one that developed was pneumonia, with the rest being: diarrhea, sepsis, otitis media and encephalitis. Clinical studies are dispassionate about the fact that the non-immunized group had a greater incidence of pneumonia and diarrhea, with striking difference. It is well known that measles weaken immunity for some time which increases the chances of children getting secondary infections, primarily, but not limited to, respiratory and digestive tract infections. These results further strengthen the link between immunization status and measured clinical severity[12-14].

The outcome data add even more evidence to the case for full vaccination. The recovery rate was highest among those children who were fully vaccinated, whereas death was most common in those who were unvaccinated. A statistically significant relationship was found between vaccination status and mortality, confirming previous studies which found that vaccination not only decreases infections but also significantly lowers the chances of harsh illness and death. In this study, the so-called non-vaccinated group represented the majority of deaths which is in alignment with patients in the region and international health system studies[15-17].

ICU admissions appeared to be more common among those with incomplete or no vaccination status, showing more severe disease manifestations. Among the children admitted, malnutrition was likely to have impaired some outcomes, especially in the presence of other complications. Children exhibiting measurable degrees of malnutrition are at an increased risk of infectious diseases, including but not limited to measles[18-20].

These findings reaffirm the importance of strengthening immunization programs, particularly in communities with low vaccine uptake. Efforts should focus on increasing awareness, addressing misconceptions, and improving accessibility to ensure children complete their immunization schedules. Additionally, integrating nutritional support with routine immunization campaigns could enhance overall child health outcomes.

CONCLUSION

This study demonstrates that a large proportion of children admitted with measles were either unvaccinated or partially vaccinated, and these groups experienced higher rates of complications and mortality. Pneumonia and diarrhea were the most common complications, and mortality was significantly associated with lack of immunization. These findings underline the crucial role of complete measles vaccination in preventing severe disease and death. Strengthening routine immunization services, coupled with community education and nutritional interventions, remains essential in reducing the burden of measles and improving pediatric health outcomes.

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