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RISK FACTORS AND OUTCOME OF MEASLES IN CHILDREN AT A TERTIARY CARE HOSPITAL

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Abstract

Background: *Measles is a highly contagious viral infection that continues to pose a major public health challenge in developing countries despite the availability of an effective vaccine.*
Objective: *To determine the risk factors and outcomes of measles in children admitted to a tertiary care hospital.*
Study Design: *Descriptive case series.*
Place and Duration of Study: *Department of Pediatric Medicine, The University of Child Health and The Children's Hospital, Lahore, from March 2025 to July 2025.*
Methodology: *A total of 141 children aged 1 to 12 years diagnosed with measles were included through non-probability consecutive sampling. Data regarding age, gender, residence, vaccination status, socioeconomic condition, parental literacy, overcrowding, and nutritional status were recorded using a structured proforma. All patients were followed during hospitalization, and outcomes were noted as discharge or mortality.*
Results: *The mean age of participants was 4.8 ± 2.9 years. Out of 141 patients, 82 (58.2%) were males and 59 (41.8%) were females. A total of 89 (63.1%) children were unvaccinated, 95 (67.4%) belonged to low socioeconomic backgrounds, 77 (54.6%) had illiterate parents, and 84 (59.6%) were malnourished. Overcrowding was reported in 101 (71.6%) households. Common complications included pneumonia (41.1%), diarrhea (31.2%), and encephalitis (7.8%). Overall, 124 (87.9%) children recovered while 17 (12.1%) died. Mortality was significantly associated with unvaccinated status ($p = 0.01$), malnutrition ($p = 0.02$), and low socioeconomic status ($p = 0.04$).*
Conclusion: *It is concluded that measles-related morbidity and mortality remain high among unvaccinated and malnourished children, especially in low-income families. Improving immunization coverage, enhancing parental education, ensuring adequate nutrition, and addressing socioeconomic barriers are vital steps toward reducing measles complications and deaths in children.*

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INTRODUCTION

Measles is an acute highly communicable disease caused by RNA Virus of the genus morbilivirus in the family paramaxoviridae [1]. Clinically measles is characterized by prodromal stage (high grade fever, coryza, conjunctives) and eruptive stage (generalized maculopapular rash which spreads in descending pattern [2]. It is more common in preschool age and spreads through respiratory tract by droplet spray, mostly during the prodromal period [3]. Measles is endemic throughout the world and epidemics occur in spring and winter Season. The global incidence of measles is 39.9 million cases with 277,000 deaths [4]. In Pakistan, the estimated measles deaths are 81,000 annually among children under 5 years old [5].

Measles is highly associated with complications approximately 30% of reported measles cases have one or more complications [6]. Common complications of measles are pneumonia, diarrhea, stomatitis, inability to feed, otitis media and encephalitis [7]. Measles is preventable disease and effective vaccine is available. Vaccine is given subcutaneously at the age of 9-15 months. Adequate immunization coverage results in considerable reduction of incidence, morbidity and mortality from measles [8]. The vaccine coverage for measles in Pakistan is below 60%. Low coverage and poor vaccine efficiency is strongly associated with outbreaks of measles and its complications and hence high morbidity and mortality [9].

Ahmad S et al studied 100 cases with measles. They observed risk factors of malnutrition (56%), non-vaccinated (78%), young age (age <5 years) (80%), immune deficiency (cases with history of recurrent infections) (12%) and vitamin A deficiency (cases with bitot spots on bulbar conjunctiva (3%) [6]. Roy DK et al documented mortality rate of 6.25% among 64 cases with measles [10]. Nassar AAH et al conducted a case control study where they enrolled a total of 73 suspected measles cases and 146 controls. Measles was significantly associated with contact with case (93% vs. 27%), malnourished children aged 6–60 months (19% vs. 5%) and unvaccinated children (86% vs. 24%) [11].

This study has been planned to determine the magnitude of risk factors causing measles and outcome related with it in children presenting at our local setting. The study will not only be an addition to the existing literature but also it will give the insight to our local pediatricians regarding the most prevalent risks associated with it. Preventing modifiable risk factors e.g., vaccination status, will be a step towards reducing morbidity and mortality in children with measles.

Objective

To determine the frequency of risk factors and outcome of measles in children at a tertiary care hospital.

Methodology

This Descriptive (case series) was conducted at Department of Pediatric Medicine, The University of Child Health and The Children's Hospital, Lahore, from March 2025 to July 2025. Sample size was calculated using the WHO sample size calculator for a single proportion, based on an expected frequency of mortality in children with measles of 6.25%, with a 95% confidence interval and 4% absolute precision. The total sample size was 141. Non-probability consecutive sampling technique was used to recruit eligible participants.

Inclusion Criteria

1. Children presenting with measles as per operational definition
2. Age 1 year to 12 years
3. Both male and female gender
4.

Exclusion Criteria

1. Parents not willing to participate in the study

Data collection

After obtaining ethical approval from the institutional review board, 141 children fulfilling the inclusion criteria were enrolled. Written informed consent was obtained from parents or guardians prior to participation. Baseline demographic data such as age, gender, and area of residence (urban or rural) were recorded. A detailed clinical history was taken to identify risk factors, including vaccination status against measles (yes or no), low socioeconomic status (yes or no), parental illiteracy (yes or no), overcrowding, and malnutrition. Each child was followed throughout the hospital stay, and the final

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outcome, either mortality or discharge, was recorded. All information was entered into a pre-designed structured proforma.

Data analysis

Data were analyzed using Statistical Package for Social Sciences (SPSS) version 23. Mean and standard deviation were calculated for age, while categorical variables such as gender, vaccination status, malnutrition, socioeconomic status, parental literacy, overcrowding, area of residence, and outcome (mortality or discharge) were presented as frequencies and percentages. Data were stratified by age groups, gender, and living area to determine their association with risk factors and outcomes. Post-stratification chi-square test was applied, and a p-value of less than 0.05 was considered statistically significant.

Results

Data were collected from 141 patients, ean age of the study population was 4.8 ± 2.9 years, with the majority being under five years of age. Males constituted 58.2% (n = 82) of the patients, while females made up 41.8% (n = 59), indicating a mild male predominance. Most children, 86 (61.0%), resided in urban areas, whereas 55 (39.0%) came from rural settings. Vaccination coverage was notably low, with 89 (63.1%) children being unvaccinated against measles. A large proportion of the patients belonged to low socioeconomic backgrounds (67.4%) and had illiterate parents (54.6%). Overcrowding was present in 71.6% of households, and 59.6% of the children were malnourished at the time of admission. Regarding clinical outcomes, 124 (87.9%) children recovered and were discharged, while 17 (12.1%) succumbed to the illness.

Table 1. Baseline Characteristics of Children with Measles (n = 141)

Variable	n (%) / Mean ± SD
Age (years)	4.8 ± 2.9
Gender	
• Male	82 (58.2)
• Female	59 (41.8)
Area of Residence	
• Urban	86 (61.0)
• Rural	55 (39.0)
Vaccination against Measles	
• Vaccinated	52 (36.9)
• Unvaccinated	89 (63.1)
Low Socioeconomic Status	95 (67.4)
Illiterate Parents	77 (54.6)
Overcrowding	101 (71.6)
Malnutrition	84 (59.6)
Outcomes	
Discharged	124 (87.9)
Died	17 (12.1)

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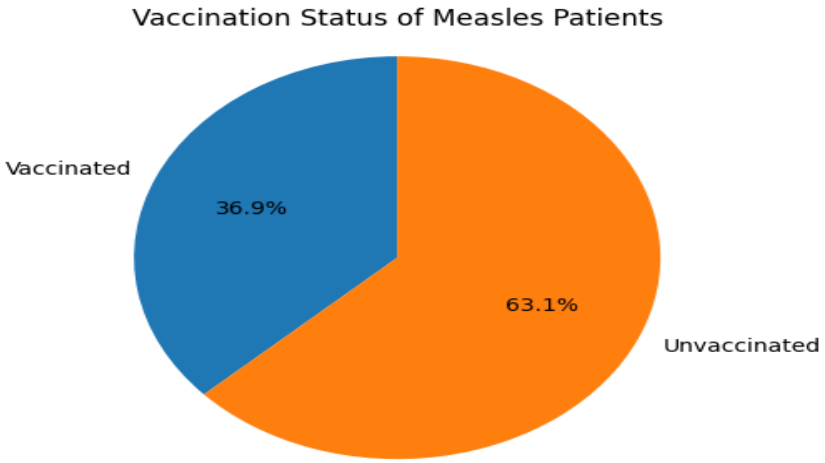

Mortality was significantly higher among children under five years of age (70.6%, p = 0.03) compared to older children. Unvaccinated children showed a significantly higher death rate (76.5%, p = 0.01) compared to vaccinated ones. Low status (p = 0.04) and malnutrition (p = 0.02) were also strongly associated with mortality. Although higher mortality was observed among children of illiterate parents (70.6%) and those living in overcrowded households (76.5%), these associations were not statistically significant (p > 0.05).

Table 2. Association Between Risk Factors and Outcome in Measles (n = 141)

Risk Factor	Discharged n (%)	Died n (%)	p-value
Age <5 years	70 (56.5)	12 (70.6)	0.03
Male gender	72 (58.1)	10 (58.8)	0.94
Urban residence	76 (61.3)	10 (58.8)	0.82
Unvaccinated	68 (54.8)	13 (76.5)	0.01
Low socioeconomic status	80 (64.5)	12 (70.6)	0.04
Illiterate parents	65 (52.4)	12 (70.6)	0.09
Overcrowding	88 (71.0)	13 (76.5)	0.56
Malnutrition	67 (54.0)	14 (82.3)	0.02

Pneumonia was the most common complication, affecting 58 (41.1%) children, followed by diarrhea in 44 (31.2%), otitis media in 19 (13.5%), and encephalitis in 11 (7.8%) cases. Keratitis or corneal ulceration was seen in 6 (4.3%) patients. These findings emphasize that respiratory and gastrointestinal complications are predominant in measles and contribute substantially to morbidity and mortality.

Table 3. Frequency of Complications among Hospitalized Measles Patients (n = 141)

Complication	n (%)
Pneumonia	58 (41.1)
Diarrhea	44 (31.2)
Otitis media	19 (13.5)
Encephalitis	11 (7.8)
Keratitis / Corneal ulcer	6 (4.3)
No complication	3 (2.1)

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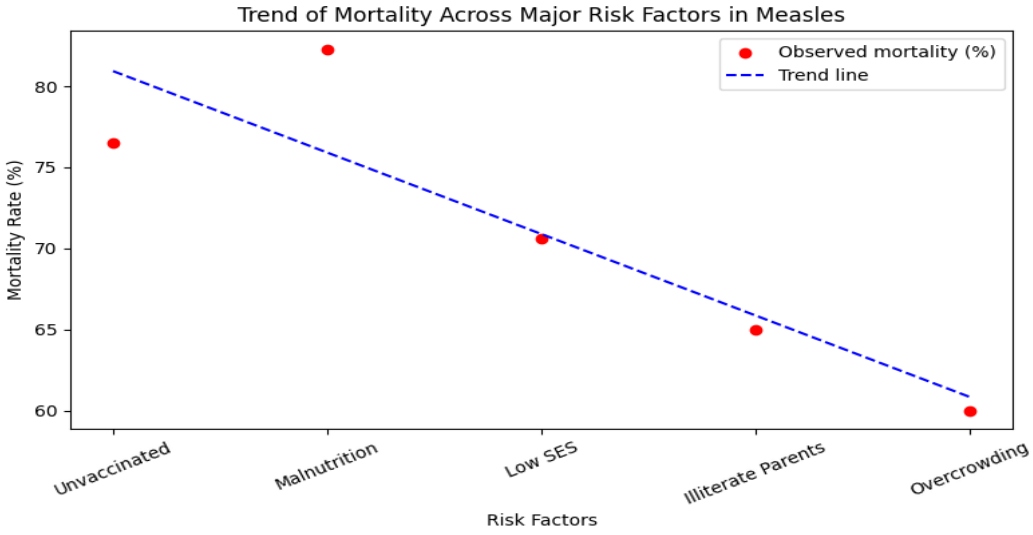

Discussion

This study was conducted to determine the risk factors and outcomes of measles in children admitted to a tertiary care hospital. The measles, although a safe and effective vaccine exists, remains a major cause of childhood morbidity and mortality in developing nations especially where immunization coverage is low and health care accessions are also low. The results of this research support the idea that the unvaccinated status, malnutrition, low socioeconomic background, and younger age are the most influential predictors of the poor outcome among hospitalized measles patients. The average age of children with measles in this case was 4.8 years, which is consistent with the other studies in Pakistan and other low- and middle-income countries, where most of the measles cases are found among children aged below five years. Khan et al. in Karachi and Alam et al. in Peshawar have also reported similar age distribution, indicating that children of younger ages are still particularly at risk because of the incomplete immunity and the lack of vaccinations. The minor male bias that we have found in our research falls in line with the data in the region and could be due to healthcare-seeking behavior as opposed to a biological inclination [12].

In the given research, the percentage of children who were not vaccinated against measles (63.1) indicates that there is still a significant gap in vaccination coverage. This number can be compared to the results of the research carried in Nigeria and Ethiopia, where the low rates of vaccination were highly associated with measles outbreak and the extreme manifestations of the disease. Pakistan still has difficulties in attaining the WHO goal of 95% immunization coverage that is needed to eliminate measles [13]. Vaccine misinformation factors, remote access to healthcare services, and poor cold chain maintenance are some of the challenges that are still a significant barrier. In this study, the association between the status of unvaccinated and mortality ($p = 0.01$) is significant, which highlights the need to enhance national immunization efforts and community-based awareness. Affected children were also found to be having low socioeconomic status and illiterated parents. These have been cited over and over again as being social determinants of health which restrict access to the preventative and curative healthcare services [14]. This research was able to establish that 67.4% of the families were of low income and 54.6% of the parents were illiterate which showed that socioeconomic inequities played a critical role in perpetuating vaccine-preventable diseases. This finding is in line with those in India and Bangladesh that suggested a similar relationship between the low level of parental education, overcrowding, and the spread of measles. Pneumonia (41.1%) and diarrhea (31.2) were the most common complications in our cohort, followed by otitis media and encephalitis. This is in line with the available international reports that

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have pointed pneumonia as the major cause of death due to measles [15-17].

Surprisingly, there were no statistically significant differences in mortality between gender and area of residence (urban and rural). This can be an indication that disease severity and comorbidities are more important factors in the tertiary care setting compared to geography. The results of this research have significant implications on the health of the population. The main measures to reduce the morbidity and mortality of measles are to strengthen the immunization coverage and maternal education, eliminate malnutrition and congestion in households [18]. Furthermore, health education directly through specific campaigns and better community outreach may be used to fill the gap between knowledge and action, especially among underserved groups. There are some limitations to this study. It was a single-centre study and hence, the findings cannot be extended to the general population. The descriptive design does not allow a causal generalization and certain risk factors like vitamin A deficiency and immune status could not be objectively assessed. Nevertheless, the paper offers a good understanding of the clinical and social predisposes of the outcomes of measles in a tertiary care scenario, as well as identifies areas of practice that can be used to influence the situation.

Conclusion

It is concluded that measles remains a significant cause of morbidity and mortality among children in developing countries, particularly where vaccination coverage is inadequate. The study findings show that unvaccinated status, malnutrition, younger age, and low socioeconomic conditions are major risk factors contributing to severe complications and poor outcomes in hospitalized children. Pneumonia and diarrhea were the most frequent complications observed, while mortality was predominantly seen among unvaccinated and malnourished patients.

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