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ORIGINAL ARTICLE

Clinical Characteristics and Outcomes in Pediatric Patients at outdoor Experiences with Measles

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ABSTRACT

Background: *Measles remains a significant cause of pediatric morbidity and mortality worldwide, especially in low-resource settings with suboptimal vaccination coverage. Outdoor patients often represent severe disease with high risks of complications.* ***Aim of the study:*** *To evaluate the clinical characteristics, demographic profile, immunization status, and outcomes of pediatric outdoor patients with measles, with a focus on identifying factors associated with adverse outcomes.* ***Methods:*** *A descriptive cross-sectional study was conducted involving 55 pediatric outdoor patients with clinically and/or laboratory-confirmed measles. Data on demographic variables, nutritional and immunization status, clinical presentation, complications, and outcomes were collected and analyzed.* ***Result****: The majority of patients were under 5 years of age (61.82%), with a slight female predominance (52.73%) and predominantly from rural (67.27%) and lower socioeconomic backgrounds (69.09%). Immunization coverage was high (80.00%), with 61.82% reporting known contact with measles cases. Tachypnea (50.91%) and gastrointestinal symptoms (27.27%) were common clinical features. Malnutrition and anemia were present in 14.54% and 34.55% of patients, respectively. Vaccinated children demonstrated significantly better outcomes, with a lower mortality rate (1.82%) compared to unvaccinated children (3.64%).* ***Conclusion:*** *Low immunization coverage, young age, malnutrition, and rural residency are associated with increased severity and poorer outcomes in pediatric measles. Strengthening vaccination programs and addressing socioeconomic barriers are essential to reduce measles-related morbidity and mortality in vulnerable populations.*

Keywords: *Measles, Pediatric, Immunization, Clinical Characteristics, Malnutrition, Outcomes*

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INTRODUCTION

Measles is an acute, highly contagious viral disease caused by the measles virus, clinically characterized by fever, cough, coryza, conjunctivitis, and a generalized maculopapular rash[1]. It is transmitted primarily via respiratory droplets and airborne spread, and due to its high basic reproduction number, measles can rapidly cause outbreaks in susceptible populations[2]. Globally, the burden of measles has resurged in recent years, with an estimated 15 million cases reported worldwide in 2023[3]. In Bangladesh, the challenge remains significant, with 4,181 measles cases documented in 2019, many originating from outbreaks in refugee settlements and underserved communities[4]. Although measles is preventable through a safe and effective vaccine, it continues to pose a significant public health threat where immunization coverage is inadequate[5]. The virus spreads explosively when herd immunity falls below the critical threshold, leading to high attack rates in unvaccinated groups[6]. Children under five years of age are especially vulnerable to severe complications such as pneumonia, diarrhea, otitis media, and encephalitis, which can cause long-term disability or death. Malnutrition and immunosuppression further increase the risk of severe outcomes[7]. In recent years, global immunization progress has been undermined by multiple factors, including conflict, mass displacement, inadequate health infrastructure, misinformation, and the COVID-19 pandemic's disruption of routine vaccination services[8]. Many regions, particularly in low- and middle-income countries, have struggled to recover vaccination coverage to pre-pandemic levels. The persistence of immunity gaps has created an environment ripe for recurrent outbreaks, which in turn increase pediatric hospitalizations and mortality rates[9]. In Bangladesh, large-

scale immunization campaigns under the Expanded Program on Immunization (EPI) have greatly reduced measles-related morbidity and mortality[10]. However, challenges persist, including population displacement from neighboring countries, overcrowded urban settlements, rural healthcare access barriers, and occasional lapses in vaccine distribution systems[11]. Refugee camps remain high-risk environments due to overcrowding, malnutrition, and limited health services. In addition, underreporting and inconsistent surveillance limit the accurate assessment of measles burden, particularly in hospitalized pediatric cases[12]. Hospital-based research plays a crucial role in filling these knowledge gaps by documenting the clinical spectrum, complication rates, hospital stay durations, and mortality outcomes among measles patients[13]. Such information can guide the refinement of treatment protocols, strengthen public health planning, and ensure that vaccination and case management strategies are targeted and evidence-based[14]. Given the continuing circulation of the virus and the country's unique socio-demographic challenges, updated and context-specific data are essential. Understanding the patterns of clinical presentation and outcomes among hospitalized children with measles can help optimize resource allocation, improve patient care, and reduce the risk of severe complications or death[15]. This study aims to evaluate the clinical characteristics and outcomes of pediatric outdoor patients with measles in Bangladesh, providing evidence to inform patient care strategies and strengthen public health interventions.

METHODS & MATERIALS

This retrospective observational study was carried out in the Department of Infectious Disease & Community Pediatrics, Bangladesh Shishu Hospital & Institute, Dhaka, Bangladesh. The study was conducted from January 2023 to December 2023. The study included 55 pediatric outdoor patients with measles over the study period, as confirmed by clinical assessment.

Inclusion Criteria

- Children aged <15 years with a clinical diagnosis of measles according to WHO criteria.
- Cases must be identified during outdoor (outpatient) visits.
- Presence of fever, generalized rash starting from the face and spreading downward, plus at least one of the following:
    - Cough
    - Coryza (runny nose)
    - Conjunctivitis

Exclusion Criteria

- Children with documented chronic illnesses (e.g., congenital heart disease, chronic lung disease, chronic liver disease).
- Immunodeficiency disorders (e.g., HIV, primary immunodeficiency).
- Presence of other febrile rash illnesses not confirmed as measles.
- Incomplete hospital records preventing full data collection.

Ethical Considerations

Ethical approval was obtained from the hospital's institutional review board. Patient confidentiality was maintained by anonymizing data, and no identifiable information was included in the analysis.

Clinical and Diagnostic Criteria

Pneumonia was diagnosed using WHO criteria: fast breathing (≥50 breaths/min for children 2–12 months, ≥40 breaths/min for children 12 months–5 years) or chest indrawing, with radiographic confirmation of pulmonary infiltrates when indicated. Encephalitis was diagnosed in the presence of altered consciousness, convulsions, neurological deficits, or irritability, supported by cerebrospinal fluid lymphocytic pleocytosis when lumbar puncture was indicated. Hepatomegaly cases underwent liver function tests. Chest radiographs and cerebrospinal fluid analysis were performed as clinically warranted.

Treatment Protocol

All children received vitamin A supplementation — 100,000 IU/day for those aged 6 months to 1 year, and 200,000 IU/day for children older than 1 year — in accordance with WHO guidelines. Supportive and complication-specific treatments were provided as needed.

Data Collection

Patient records were reviewed to extract information on age, sex, place of residence, socioeconomic status, presenting symptoms, complications, vaccination status and doses received, recent exposure to a confirmed measles case (within 3 weeks), nutritional status (weight-for-age based on National Center for Health Statistics growth charts). All children were examined to monitor disease progression and detect complications.

Data Analysis

Data were entered into Microsoft Excel and analyzed using SPSS version 26.0. Categorical variables were expressed as frequencies and percentages. The primary outcomes measured were recovery and death depending on vaccination status.

RESULT

The age distribution revealed that the majority of cases were between 1 to 5 years (41.82%), followed by 6 to 10 years (32.73%), with infants under one year accounting for 20.00%. Children aged 11 to 12 years constituted the smallest group (5.45%). The gender distribution was relatively balanced, with a slight female predominance (52.73%) compared to males (47.27%). Most patients (67.27%) originated from rural areas, and a substantial proportion belonged to the lower socioeconomic class (69.09%) (Table 1). Regarding baseline

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characteristics, 34.55% of patients were anemic, while severe and moderate acute malnutrition were observed in 7.27% each. Immunization coverage was notably high, about 80.00% having received any measles vaccination, whereas 20.00% were unvaccinated. Contact history with measles cases was positive in 61.82% of patients (Table 2). Clinically, tachypnea was the predominant presenting feature, affecting over half of the cohort (50.91%), followed by gastrointestinal symptoms, including diarrhea and vomiting (27.27%). Less common signs included Koplik's spots (7.27%), stridor (3.64%), convulsions (3.64%), and hepatosplenomegaly in a minority (Table 3). Pneumonia without dehydration was the most prevalent complication, affecting 40.00% of patients. This was followed by diarrhea with dehydration, observed in 38.18% of cases, and pneumonia with dehydration, which accounted for 12.73%. Notably, encephalitis, a severe neurological complication, was documented in 9.09% of patients (Figure 1). Out of all patients, 31 (56.36%) were vaccinated, 19 (34.55%) were not vaccinated, and the vaccination status of 5 patients (9.09%) was unknown (Table 4). Vaccination coverage varied significantly by age group, with the highest vaccination rate seen in children aged 1–5 years (69.57%), followed by those aged 11–12 years (66.67%), 6–10 years (55.56%), and lowest among infants under one year (27.27%) (Table 5).

Table – I: Demographic characteristics of the study population (*n*=55)

Variables	Frequency (n)	Percentage (%)
Age (year)		
<1	11	20.00
1- 5	23	41.82
6- 10	18	32.73
11-12	3	5.45
Gender		
Male	26	47.27
Female	29	52.73
Location		
Urban	18	32.73
Rural	37	67.27
Socioeconomic status		
Lower-class	38	69.09
Middle-class	15	27.27
Upper-class	2	3.64

Table – II: Baseline characteristics of the study population (*n*=55)

Variables	Frequency (n)	Percentage (%)
Nutritional status		
Severe Malnutrition	4	7.27
Moderate Acute Malnutrition	4	7.27
Anemia	19	34.55
Immunization status		
Immunized	44	80.00
Not-immunized	11	20.00
Contact history		
Contact	34	61.82
Non-contact	17	30.91
Unknown	4	7.27

Table – III: Clinical features of the study population (*n*=55)

Clinical features	Frequency (n)	Percentage (%)
Tachypnea	28	50.91
Diarrhea and vomiting	15	27.27
Koplik's spots	4	7.27
Stridor	2	3.64
Convulsions	2	3.64
Hepatomegaly	1	1.82
Splenomegaly	2	3.64
Cervical lymphadenopathy	1	1.82
Disturbance in level of con	1	1.82

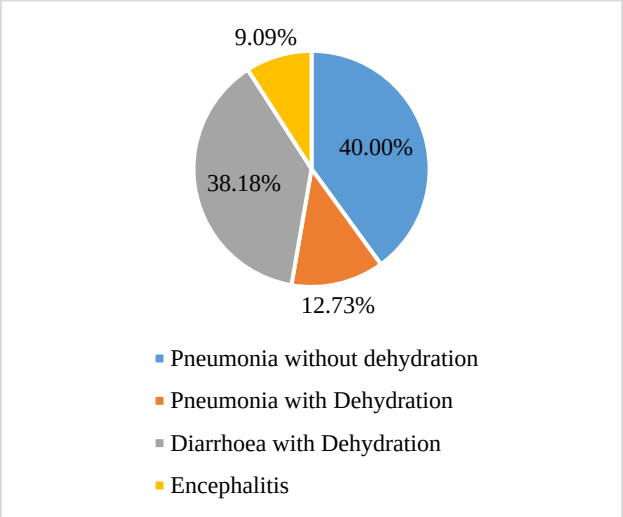

Figure – 1: Complications shown in the study population (*n*=55)

Table – IV: Vaccinated status among patients (*n*=55)

Vaccination status	Frequency (n)	Percentage (%)
Vaccinated	31	56.36
Not vaccinated	19	34.55
Unknown	5	9.09

Table – 5: Vaccinated status based on age (*n*=55)

Vaccinated	Frequency (n)	Percentage (%)
<1 year (n=11)	3	27.27
1-5 years (n=23)	16	69.57
6-10 (n=18)	10	55.56
11-12 years (n=3)	2	66.67

DISCUSSION

Measles remains a formidable public health concern, particularly in low- and middle-income countries, where gaps in immunization coverage, limited healthcare access, and underlying malnutrition collectively fuel recurrent outbreaks and severe disease presentations. Although measles is preventable through an effective and low-cost vaccine, its persistence reflects systemic weaknesses in public health and

community engagement. Pediatric cases often present with severe complications, prolonged stays, and high mortality, particularly in socioeconomically disadvantaged or rural settings, underscoring the need for targeted interventions to reduce disease burden. In the present study, the majority of measles cases were observed in children aged 1–5 years (41.82%), followed by those aged 6–10 years (32.73%) and infants under 1 year (20%). This age distribution aligns closely with findings reported from Chandigarh[16], West Bengal[17], and Pakistan[18]. In the present study a slight female predominance was observed (52.73%), which contrasts with earlier reports of male predominance; Satpathy et al.[17] described a male predominance and Hirfanoglu[19] reported a male:female ratio of 2:1. The predominance of rural residence (67.3%) and lower socioeconomic status (69.1%) among hospitalized cases aligns with prior reports demonstrating that measles disproportionately affects children from underserved communities, where healthcare access and immunization services may be limited[20-21]. National data also indicate that children from the poorest socioeconomic quintile face more than twice the risk of measles-related mortality compared to wealthier peers, highlighting the influence of socioeconomic factors on outcomes[22]. Nutritional deficiencies were significant in our cohort, with 14.54% exhibiting moderate to severe malnutrition and 34.55% anemia. These rates are consistent with Black et al. (2013) and Kassebaum et al. (2014), who demonstrated that malnutrition and anemia are prevalent comorbidities that exacerbate disease severity by impairing host immunity[23-24]. Notably, our malnutrition prevalence was somewhat lower than reported in similar settings by Rahat et al. (2020), potentially reflecting differences in local nutritional programs or sampling frames[25]. Immunization status emerged as a critical determinant of clinical outcomes in our cohort. Notably, 80% of children were vaccinated. A study at Sheikh Zayed Hospital in Rahim Yar Khan, Pakistan, showed that 56% of hospitalized measles patients were from rural areas, with 58% unvaccinated despite an 80% national immunization rate, underscoring rural population vulnerability[26]. Clinically, tachypnea was the predominant symptom (50.91%), consistent with Gershon et al. (2018) and Rudan et al. (2008), who identify respiratory distress as a hallmark of severe pediatric infections[27-28]. The relatively low detection of Koplik's spots (7.27%) contrasts with classical descriptions but may be attributable to delayed presentation or clinical under-recognition, a phenomenon reported by Moss (2017)[29]. Comparable observations have been reported in other cohorts, including hospitalized children with measles, where the prevalence ranged from 23–30%[30]. A national survey in Japan similarly documented Koplik's spots in 23.7% of measles and suspected cases, with positivity influenced by timing of examination and concurrent viral infections[31]. Pneumonia without dehydration (40.0%) and diarrhea with dehydration (38.18%) were the predominant complications in our cohort. Encephalitis occurred in 9.09% of patients, indicating a measurable risk of severe neurological sequelae. These results align with previous reports; Anis-ur-Rehman described pneumonia in 16–77% of hospitalized cases, diarrhoea as the second most frequent complication, and encephalitis-associated mortality up to 57.1%[32].

CONCLUSION AND RECOMMENDATIONS

Measles remains a significant cause of morbidity and mortality among hospitalized pediatric patients, especially in settings with low vaccination coverage and high rates of malnutrition. This study highlights that young age, rural residence, and poor immunization status are key factors associated with severe clinical presentations and adverse outcomes. Respiratory and gastrointestinal complications were common, with unvaccinated children experiencing higher mortality. Therefore, strengthening routine immunization, improving healthcare access, and addressing nutritional deficiencies are essential to reduce measles burden. These findings reinforce the urgent need for comprehensive public health strategies to protect vulnerable children and move closer to measles eradication.

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