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A Series of 10 Severe Measles Cases in Pediatric Intensive Care

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Abstract

Despite widespread pediatric immunization reducing the overall burden of measles, severe and sporadic cases, particularly in unvaccinated individuals or infants, continue to arise during local outbreaks. This retrospective study analyzed the clinical features, laboratory findings, and outcomes of 10 confirmed measles cases in children admitted to a pediatric intensive care unit (PICU) at a tertiary hospital from June 1, 2024, to June 25, 2025. The median age of these patients was 11 months (range: 2-72 months). Bronchopneumonia (n=7) and/or sepsis (n=3) were the most common reasons for PICU admission. Complications observed included pediatric acute respiratory distress syndrome (PARDS, n=2), sepsis (n=3), and meningoencephalitis (n=1). The cohort's mortality rate was 20%. Unvaccinated status, malnutrition, pre-existing medical conditions, and bronchopneumonia were identified as key risk factors for PICU admission. Even with early PICU intervention, measles-related mortality remains substantial, particularly in unvaccinated children and those with underlying health issues.

Keywords : ***Outbreaks; Measles; Mortality; ARDS (acute respiratory distress syndrome); Pediatric critical care, Unvaccinated.***

1. Introduction :

Measles is a highly transmissible viral infection causing significant morbidity and mortality, especially in unvaccinated populations [1]. While common complications include otitis media, severe cases can lead to critical conditions like pneumonia or neurological issues, often requiring PICU admission [2], [3]. The WHO reports the measles vaccine has saved approximately 31.7 million lives globally since 2000, significantly reducing incidence, though cases saw an increase in 2019 before a decrease in 2020 [4]. In 2020, 26 major outbreaks occurred across five WHO regions, with 65% in African nations [4]. Despite a 94% drop in deaths since 2000, measles remains a major public health concern [4], [5]. Local outbreaks persist, frequently linked to immunization service disruptions, as seen during and after the COVID-19 pandemic [6], [7]. This study aims to evaluate clinical and laboratory data from measles patients admitted to our facility's PICU between June 2024 and June 2025.

2. Materials and methods :

This retrospective study involved the evaluation of medical records of patients with confirmed measles who required PICU admission at a tertiary hospital between June 1st, 2024, and June 30th, 2025. Measles diagnosis was established based on clinical findings (fever, malaise, cough, coryza, conjunctivitis, Koplik spots, and a maculopapular rash). Ethical approval for the study was obtained from the institutional ethics committee.

Data collected included age, gender, anthropometric measurements, vaccination status, socioeconomic status, history of contact with a measles case, diagnosis upon PICU admission, received treatments (antibiotics), and complications. Laboratory data such as complete blood counts, serum C-reactive protein (CRP) and procalcitonin levels, and blood

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culture results were extracted from medical records. Pediatric Risk of Mortality (PRISM) scores were calculated for all patients based on the worst clinical and laboratory data within the first 24 hours of admission. Information on supportive extracorporeal therapies, including renal replacement therapy, was also recorded. Patient outcomes were categorized as "died" or "discharged".

3. Results :

Clinical and laboratory parameters of 10 children (6 boys and 4 girls) admitted to the PICU were evaluated. The median age of the patients was 11 months, with a range between 2 and 72 months. Five children (50%) were aged between 3-12 months, three children (30%) were under 3 months, and two children (20%) were over 12 months (ages 36 months and 72 months) (tableau1).

Two children (20%) had a history of contact with a patient exhibiting a measles-like rash. Nine of the 10 children were younger than the age for the measles-containing vaccine in the national immunization program, while one child (over 1 year) had missed their MMR vaccine schedule (unvaccinated). One patient had a known underlying chronic lung disease, and another had a congenital heart defect. Anthropometric measurements (weight-for-age) showed that four patients (40%) were below the 3rd percentile for age, indicating malnutrition.

the laboratory findings underscore the severity of measles cases requiring PICU admission. Elevated inflammatory markers (CRP, PCT) are particularly prominent in patients with severe complications and adverse outcomes, highlighting their utility in assessing severity and prognosis in complicated measles. Thrombocytopenia in some cases also points to advanced systemic dysfunction (tableau 2).

Fever and a maculopapular rash (figure 1) were universally observed presenting symptoms. The time from symptom onset to presentation at the hospital ranged from 24 to 96 hours. Eight patients were admitted from the pediatric emergency unit, and two from general inpatient wards. PRISM scores varied from 8 to 32, with predicted mortality ranging from 3.5% to 80% (tableau 3).

Seven patients were admitted with respiratory distress due to bronchopneumonia, necessitating oxygen supplementation. Two children were diagnosed with pediatric acute respiratory distress syndrome (PARDS). One 72-month-old boy presented with status epilepticus, and a lumbar puncture was performed due to suspected meningoencephalitis. CSF analysis showed a protein level of 55 mg/dL and a glucose level of 45 mg/dL. CSF gram staining was negative. Two patients experienced culture-negative sepsis. During their PICU stay, one patient developed pancytopenia, and two patients developed ARDS secondary to bronchopneumonia and sepsis. One patient required chest tube drainage due to empyema.

The length of PICU admission ranged from 4 to 18 days, and overall hospital admission varied from 7 to 35 days. One patient with chronic lung disease, who developed PARDS and septic shock. Despite extensive supportive therapies, this patient died. Another patient, who was malnourished and developed severe sepsis with multi-organ failure, also died. In total, two patients died due to measles complications, resulting in a mortality rate of 20% in this study.

Table 1. Demographical findings, clinical findings of 10 children with measles

Case N°	Age (Months)	Gender	Vaccine Status	Underlying Disease	GCS	Complications
1	4	M	unvaccinated	None	15	Bronchopneumonia
2	2	F	unvaccinated	None	14	Bronchopneumonia, Sepsis
3	9	M	unvaccinated	None	15	Bronchopneumonia
4	11	F	unvaccinated	None	15	Bronchopneumonia

5	6	M	unvaccinated	Chronic Lung Disease	12	PARDS, Septic shock, Acute renal injury
6	10	F	unvaccinated	None	15	Bronchopneumonia
7	36	M	unvaccinated	None	13	Bronchopneumonia, Empyema, Sepsis
8	5	M	unvaccinated	None	15	Bronchopneumonia
9	72	F	unvaccinated	None	9	Status epilepticus, Meningoencephalitis
10	7	M	unvaccinated	Congenital Heart Defect	12	Sepsis, PARDS

GCS: Glasgow coma score; PARDS: Pediatric Acute Respiratory Distress Syndrome

Table 2. Laboratory findings of 10 children with measles

Case Number	WBC (mm3)	Platelet (mm3)	CRP (mg/dL)	PCT (ng/mL)
1	28,500	350,000	75	0.8
2	31,000	30,000	250	90
3	24,000	400,000	45	0.6
4	19,000	510,000	60	0.7
5	35,000	25,000	300	120
6	17,000	480,000	55	0.5
7	26,000	210,000	190	40
8	20,000	330,000	80	0.9
9	29,000	180,000	110	15
10	22,000	60,000	150	70

CRP: C-reactive protein; PCT: Procalcitonin; WBC: White blood cell

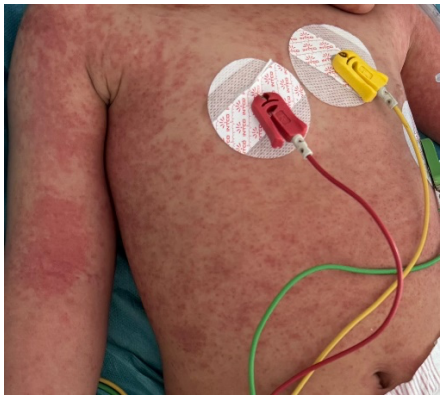

Figure 1: measles rash.

Table 3. Clinical interventions in PICU, PRISM score, predicted mortality and outcome of 10 children with measles

Case N°	Antibiotic	ECT	Mechanical Ventilation	PRISM score	Predicted Mortality	Length of PICU stay (Day)	Outcome
1	Ceftriaxone, ciprofloxacin	None	None	12	9%	5	Discharged
2	Imipenem, Amikacin	Peritoneal dialysis	IMV	28	65%	10	Died
3	Ceftriaxone	None	None	10	6.2%	4	Discharged
4	Ceftriaxone	None	None	8	3.5%	3	Discharged
5	Imipenem, ciprofloxacin, vancomycine	None	IMV	32	80%	18	Died
6	Ceftriaxone	None	None	11	8%	6	Discharged
7	Imipenem, Amikacin	None	IMV	23	49.5%	14	Discharged
8	Ceftriaxone	None	None	9	5.1%	4	Discharged
9	Ceftriaxone, Ciproflaxacin	None	IMV	21	39.3%	8	Discharged
10	Ceftriaxone, Cirpflaxacin	None	IMV	25	55%	12	Discharged

ECT: Extracorporeal Treatment; IMV: Invasive mechanical ventilation; PICU: Pediatric intensive care unit; PRISM: Pediatric risk of mortality

4. Discussion :

This retrospective study provides crucial insights into the clinical characteristics, complications, and outcomes of severe measles cases necessitating Pediatric Intensive Care Unit (PICU) admission during a recent outbreak period (June 2024 to June 2025). Despite global efforts in measles eradication, our findings underscore the persistent burden of severe disease, particularly among unvaccinated and vulnerable pediatric populations. The observed 20% mortality rate in our PICU study highlights the critical nature of measles complications, even with advanced medical support.

Our study's median patient age of 11 months is consistent with reports from other outbreaks, where infants and young children, often too young to be vaccinated or with incomplete vaccination status, bear a disproportionate burden of severe measles [1, 8]. The high susceptibility of this age group emphasizes the critical role of herd immunity, where high vaccination coverage in the general population protects those who cannot be vaccinated [9]. The fact that nine out of our ten patients were either unvaccinated due to age or missed doses underscores a significant public health challenge in maintaining high immunization rates.

Bronchopneumonia was the most frequent reason for PICU admission (n=7) and a major complication in our study, aligning with established literature identifying respiratory tract infections as the leading cause of measles-related mortality [2, 10]. Measles virus causes direct damage to the respiratory epithelium and induces significant immunosuppression, rendering patients highly susceptible to secondary bacterial infections [11]. This measles-induced immunosuppression, characterized by lymphopenia and a transient "immune amnesia," can persist for months after the acute infection, increasing susceptibility to other infections [12]. The development of pediatric acute respiratory distress syndrome (PARDS) in two of our patients further illustrates the severity of pulmonary involvement, often requiring invasive mechanical ventilation and prolonged PICU stays, as noted in previous studies on critical measles cases [3, 13].

Sepsis was another significant admission diagnosis and complication (n=3), reflecting the systemic inflammatory response and potential multi-organ dysfunction that can occur in severe measles [14]. The presence of meningoencephalitis in one patient, although less common than respiratory complications, underscores the devastating neurological sequelae that measles can inflict, ranging from acute encephalitis to subacute sclerosing panencephalitis (SSPE) years later [15].

Several risk factors for severe measles and adverse outcomes identified in our study resonate with global findings. Unvaccinated status remains the single most significant preventable risk factor [16]. Additionally, malnutrition, observed in 40% of our patients, is a well-documented exacerbating factor for measles severity and mortality [17]. Malnourished children have impaired immune responses, making them more vulnerable to severe infections and less able to recover. Underlying medical conditions, such as chronic lung disease and congenital heart defects, also significantly increase the risk of severe outcomes, as these conditions compromise respiratory and cardiovascular reserves, making them less tolerant to the physiological stress of a severe infection like measles [18].

The 20% mortality rate in our PICU study, while specific to critically ill patients, reflects the high lethality of severe measles. While global measles mortality has dramatically decreased due to vaccination, deaths still occur, primarily in low-income settings or during large outbreaks where healthcare resources may be overwhelmed [4]. Our findings are comparable to mortality rates reported in other PICU studies of measles, which often range from 10% to 30% depending on the severity of presenting illness and resource availability [19, 20]. This high mortality, despite intensive care, underscores the importance of prevention through vaccination rather than relying solely on treatment of complications.

Limitations: This study is limited by its retrospective design and the small sample size of 10 cases, which restricts the generalizability of findings and the ability to draw definitive conclusions about risk factors. The study was conducted in a single tertiary center, which may not represent the full spectrum of measles severity across different healthcare settings. Data on long-term sequelae post-discharge were also not systematically collected.

5. Conclusion :

Respiratory tract infections, acute respiratory distress syndrome (ARDS), and sepsis represent critical clinical conditions contributing to mortality and morbidity in measles patients admitted to the intensive care unit. Despite the implementation of early treatment protocols, the mortality rate associated with measles remains high, particularly among unvaccinated children and those with underlying health conditions.

Conformité aux normes éthiques

Déclaration de conflit d'intérêts

Aucun

Déclaration d'approbation éthique
Le présent travail de recherche ne contient aucune étude réalisée sur des sujets humains ou animaux par aucun des auteurs.

Déclaration de consentement éclairé
Le consentement éclairé a été obtenu de tous les participants individuels inclus dans l'étude.

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