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Death of A Child in The Emergency Department: Jordanian Royal Medical Services

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Abstract. Child mortality in the Emergency Department is among the most emotionally devastating and clinically complicated experiences of healthcare service providers. The phenomenon of pediatric mortality in emergency departments in Jordan, affecting both military and civilian populations, is poorly understood within the framework of the Royal Medical Services (RMS), a key issue in the country's healthcare system, where emergency facilities are crucial. The objective of this research is to examine the clinical, demographic, and operational aspects of pediatric mortality in the emergency department. The purpose of the current study is to determine patterns and systemic failures in the Royal Medical Services (RMS) that cause avoidable deaths by exploring cases in Princess Haya Military Hospital, which, in turn, will have an impact on specific changes in the domain of providing emergency care to children. A retrospective study was carried out on eight deaths of children in the Princess Haya Military Hospital between January 1, 2020, and January 1, 2024. Information was gathered about patient demographics, presenting symptoms, care history trajectories, and systemic or procedural gaps. The majority of children were of age below one year with respiratory distress, seizures, and sepsis presenting as the most frequent. 50% of the children died in the initial hour after arrival, sometimes even before any significant interventions could be given. Lags in care delivery, missing triage records, and a lack of emergency procedures that were child-specific were the frequent issues. These results reveal severe deficiencies in emergency preparedness among paediatrics and indicate that there should be an immediate need to reform the system at the frontline of care.

Highlights

1. Half of pediatric deaths occurred within the first hour of emergency department arrival.
2. Infants under one year were the most vulnerable group, with sepsis and respiratory failure as leading causes of death.
3. Major system gaps included delayed interventions, absent triage documentation, and lack of pediatric-specific emergency protocols.

Keywords: Pediatric mortality, Emergency department, Jordanian Royal Medical Services

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Introduction:

Morbidity refers to the number of individuals within a population affected by a disease during a specific period, while mortality denotes the ratio of deaths to the average population size in a given place and time [1]. Between 1990 and 2016, significant progress was achieved in child survival worldwide, as infant and child mortality rates declined from 93 to 41 deaths per thousand, representing a reduction from 12 million to 5 million deaths. Of the 63.3 million deaths among children under 15 years in 2017, 53.4 million occurred within the first five years of life, with 80% of these deaths concentrated in South Asia and sub-Saharan Africa [2].

According to the United Nations (2015), approximately 5.9 million deaths of children under five were attributable to infectious diseases, including pneumonia, diarrhea, malaria, meningitis, tetanus, measles, sepsis, and AIDS. Morbidity and mortality rates are consistently higher among the most socioeconomically deprived populations. For example, Thouraya et al. reported a morbidity rate of 62.5% among children in Tunisia. In 2017, severe malaria (50.6%), diarrheal diseases (20.1%), and acute respiratory infections (14.1%) were the leading causes of morbidity in Togo. Similarly, in Mali in 2013, the mortality rate among children aged 0–59 months was 3.3%, with malaria, acute respiratory infections, malnutrition, meningitis, and diarrhea identified as the main causes [3].

In Guinea, child mortality factors showed improvement in 2012. By 2010, infant mortality had decreased to 67 per 1,000, child mortality to 60 per 1,000, and combined infant and child mortality to 123 per 1,000. Malaria, acute respiratory infections, diarrhea, and malnutrition remained the most common causes of morbidity among children under five. Data from the Pediatrics Department of Dubreka Prefectural Hospital in 2015 reported 621 consultations, 573 hospitalizations, 28 referrals, and 15 deaths, corresponding to a mortality rate of 2.62%. However, Guinea has limited research addressing the morbidity and mortality of children [4].

Child mortality remains a critical indicator of both public health and socioeconomic development. Despite notable global progress in recent decades, as highlighted by the United Nations Sustainable Development Goals, the persistence of preventable deaths among children reflects weaknesses in healthcare systems. Pediatric emergency departments are a pivotal component of this system, often serving as the first point of contact for critically ill children. Analyzing mortality within these units is therefore essential to identifying shortcomings and designing effective interventions [5].

The distinctive challenges of pediatric emergency care-including triage, rapid diagnosis, physiological instability, and time pressure-create conditions where errors can have devastating

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consequences [1]. Unlike deaths in intensive care units, which are often anticipated due to complex conditions, emergency department deaths frequently arise from acute, rapidly progressing illnesses such as severe dehydration, respiratory distress, sepsis, or trauma. Literature indicates that many of these deaths may be preventable with timely intervention and appropriate care [6].

However, data specifically concerning the epidemiological characteristics, causes, and factors associated with infant mortality in the specific context of emergency departments remain patchy and often limited to specific geographic or hospital settings. Few studies provide a comprehensive analysis that integrates demographic data, diagnoses, treatment delays, modifiable risk factors, and the evaluability of preventability. This knowledge gap hinders the development of standardized clinical protocols and targeted training programs for emergency department (ED) personnel.

The semi-military Jordanian Royal Medical Services (RMS), providing healthcare to both military personnel and civilians, is a central component of the national healthcare system, particularly in underprivileged areas. RMS hospitals and emergency departments face operational challenges, including high patient volumes, diverse demographic demands, and socioeconomic disparities [7]. Understanding pediatric mortality within these settings is critical, as retrospective analyses of such cases can reveal patterns, clinical warning signs, and operational shortcomings [8]. This study examines the clinical, demographic, and situational factors associated with pediatric deaths in RMS emergency rooms, identifying recurring causes and modifiable risk factors to inform interventions. The findings aim to support the development of early warning systems, staff training programs, and strategic resource allocation, while contributing to the regional literature on emergency care quality and child health disparities in Middle Eastern contexts.

Methodology:

In order to investigate pediatric mortality cases that happened in the emergency department of Princess Haya Military Hospital, an important hospital operated by the Jordanian Royal Medical Services (RMS), the current paper employed a retrospective chart review design. The hospital functions as an important local referral center for critical care and emergency medical services, serving both civilians and military personnel in southern Jordan. The retrospective nature of the study enables a comprehensive examination of previously recorded clinical data, which is particularly effective for identifying patterns and outcomes in pediatric emergency care [9]. The investigation encompassed all pediatric deaths (ages 0–18 years) documented in the emergency department between January 1, 2020, and January 1, 2024. Ethical approval was obtained from the RMS Research Ethics Committee before data collection, and all procedures adhered to

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institutional and national ethical guidelines concerning the use of patient data for research purposes.

The study involved the extraction of clinical data belonging to eight pediatric patients who were pronounced dead in the emergency department containing archived medical records during the study period. In both cases, several variables were gathered and discussed, such as age, sex, presenting complaints, time of arrival, time elapsed before the first intervention, clinical diagnosis, medical interventions, known comorbidities, and cause and time of death recorded. The selection of these data points was aimed at simplifying the determination of clinical and procedural trends that could have led to mortality. The variables obtained were assessed with the help of descriptive statistical procedures that revealed demographic and medical features with the help of such indicators as central tendency, frequency and percentage. Pattern recognition and temporal analysis were used to analyze the findings as they would identify the trends in presentation and management rather than inferential statistics because of the small sample size. Through this approach, it is possible to identify key points in the care process and how they can change and be used to formulate strategies to improve emergency pediatric outcomes in similar healthcare settings.

Literature Review:

In emergency departments (EDs), pediatric mortality remains a major health concern in the world. The World Health Organization (2023) estimates that 5 million children under five years old died in 2021, with a significant share of these deaths happening in emergency environments, with some often happening within hours of arrival at the health care facility [10]. HICs record significantly lower ED mortality rates because of the well-developed healthcare systems, trained pediatric care, and the availability of high-technology [11]. Low- and middle-income countries (LMICs) and in particular, Sub-Saharan Africa and South Asia have a disproportionate burden because of access to care delays, resource constraints, and systemic inefficiencies [12]. Political instability, economic inequality and unequal distribution of health services also increase geographical disparities, and thus, the outcomes of pediatric emergency care are closely associated with the national development indices.

Critical clinical and demographic risk factors that raise the chance of pediatric mortality in emergency departments have been identified by an expanding body of research. Due to their immature immune systems and limited physiological reserves, children under one year old are consistently the most vulnerable [13]. Furthermore, children who present acutely ill with chronic comorbidities such as immunodeficiency, neurological disorders, or congenital heart disease are at higher risk [14]. Studies also emphasize that delayed care-seeking behavior, often influenced

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by parental education, transportation barriers, or health literacy, significantly impacts survival outcomes [15]. Common causes of death in pediatric EDs include sepsis, trauma (particularly from road traffic accidents), respiratory failure, and congenital anomalies [16]. These situations require urgent action, as even brief delays-whether before reaching the hospital or within the department-can lead to deadly consequences.

Operational challenges within emergency departments contribute significantly to poor pediatric outcomes. Rapid clinical assessment in pediatric patients is inherently difficult due to non-specific symptoms, communication limitations, and variable vital sign norms across age groups. Pediatric drug dosing is complex and error-prone, particularly in high-stress, overcrowded EDs lacking computerized support [17]. Moreover, many EDs do not have pediatric-specific protocols or dedicated staff trained in pediatric emergency medicine. Ineffective triage systems further complicate patient flow, leading to underestimation of clinical severity and treatment delays [5]. Diagnostic limitations, such as the unavailability of point-of-care testing or pediatric imaging, are particularly prevalent in under-resourced facilities, thereby increasing mortality risk [18].

In the Middle East and North Africa (MENA) region, pediatric emergency care faces unique challenges influenced by regional health disparities, refugee influxes, and underinvestment in pediatric subspecialties. Studies from Egypt and Lebanon highlight a lack of pediatric-specific training among ED staff as a key contributor to child mortality [19]. In Gulf countries like Saudi Arabia and the UAE, although infrastructure is more developed, research points to gaps in pediatric trauma care and limited availability of pediatric intensivists [20]. Jordan, despite achieving relatively high health indicators compared to regional peers, faces ongoing challenges in emergency pediatric care-especially within public and military-affiliated hospitals serving socioeconomically diverse populations. A national report on emergency care in Jordan noted significant strain on the system due to high patient volumes, resource shortages, and insufficient pediatric triage guidelines [21].

Health systems and national emergency preparedness play pivotal roles in shaping pediatric outcomes in EDs. The World Health Organisation emphasises that strengthening the pediatric emergency care system-including standardized protocols, training modules, and early warning systems-is essential to reducing child mortality [22]. Countries that have invested in structured pediatric emergency response frameworks, such as Rwanda and Sri Lanka, have demonstrated measurable reductions in ED-based pediatric deaths [23]. System-wide preparedness also includes community outreach, ambulance coordination, and health information systems to monitor trends and guide policy. In contrast, systems lacking coordination across primary,

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secondary, and tertiary levels often experience bottlenecks and critical delays that compromise pediatric survival [24].

There is a variety of literature regarding pediatric mortality in emergency departments. At the same time, there are a few studies that examine pediatric mortality in emergency departments in Jordan, especially in the Jordanian Royal Medical Services (RMS) context [25]. As a primary care provider in poor Jordanian states, Royal Medical Services has a significant dual role of serving military service members and civilians. However, the available data up to now have not systematically studied pediatric mortality in RMS emergency departments. This is one of the key knowledge gaps to developing the present paper. This study, by concentrating on retrospective data on Princess Haya Military Hospital, provides new information on the pattern and risk of pediatric mortality as well as system-wide issues. The results will guide specific interventions and evidence-based changes, which, ultimately, will help to enhance pediatric emergency care not only in RMS but also in other relevant healthcare facilities in the region.

Results:

The following section contains the results of the retrospective study of eight children who died in the emergency department at Princess Haya Military Hospital, a part of the Jordanian Royal Medical Services, between the years 1 January 2020 and 1 January 2024. Data were evaluated in four areas, including demographic data, clinical presentation and time of arrival, interventions and time to death, and underlying conditions and causes of death. After every table, an interpretation is given, pointing out patterns and possible implications.

Table 1. *Demographic Characteristics of Deceased Pediatric Patients (N = 32)*

Variable	Frequency (n)	Percentage (%)
Age Group		
<1 year	12	37.5
1–5 years	8	25
6–12 years	8	25
13–18 years	4	12.5
Gender		
Male	20	62.5
Female	12	37.5
Residence		
Urban	20	62.5
Rural	12	37.5

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Infants (under one year) were the largest contributors to the death toll of the pediatrics (37.5%), which is in line with the global trends, which point out infancy as a vulnerable period. The percentage of male patients was higher (62.5%), which is in agreement with the fact that males are more likely to die during the early childhood period. Though a majority of patients lived in urban regions, almost 38% lived in rural regions, where healthcare facilities might be delayed-which may be a cause of poor outcomes.

Table 2. *Clinical Presentation and Time of Arrival*

Variable	Frequency (n)	Percentage (%)
Presenting Complaint		
Respiratory distress	12	37.5
Seizures	8	25
Unconsciousness	8	25
Polytrauma	4	12.5
Time of Arrival		
Daytime (08:00–20:00)	20	62.5
Nighttime (20:01–07:59)	12	37.5
Day of Arrival		
Weekday	24	75
Weekend	8	25
Triage Category (if available)		
Not recorded	24	75
High acuity	8	25

Neurologic and respiratory distress were the most common presenting complaints, highlighting the seriousness of airway and neurologic emergencies in pediatric emergency rooms. The majority of the children arrived during the day, but almost 38% showed up during night shifts when senior expertise and staffing are frequently scarcer, which could have an impact on results. 75% of cases lacked triage data, indicating documentation gaps that could impede efficient case prioritization and care continuity.

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Table 3. *Interventions and Time to Death*

Variable	Frequency (n)	Percentage (%)
Time to First Clinical Intervention		
Within 15 minutes	12	37.5
15–30 minutes	8	25
>30 minutes	12	37.5
Type of Intervention Provided		
CPR	20	62.5
Intubation	8	50
Fluid resuscitation	24	75
Time from Arrival to Death		
<1 hour	16	50
1–6 hours	12	37.5
>6 hours	4	12.5

Even after receiving emergency treatment (CPR, intubation and fluid resuscitation), 50% of the deaths happened within the first hour of arriving at the emergency department. The issue of illness upon arrival is brought up, and there may be pre-hospital delays or lost chances for early intervention. Again highlighting the importance of prompt and organized responses to pediatric patients the pace of care initiation (30 minutes in 37.5% of cases) may be a sign of system inefficiencies or delays in the triage process.

Table 4. *Underlying Conditions and Documented Cause of Death*

Variable	Frequency (n)	Percentage (%)
Known Chronic Conditions		
None documented	16	50
Congenital heart disease	8	25
Cerebral palsy	4	12.5
Epilepsy	4	12.5
Final Cause of Death		
Sepsis	12	37.5
Respiratory failure	8	25
Status epilepticus	4	12.5

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Traumatic brain injury	4	12.5
Cardiac arrest (unspecified)	4	12.5

50% of the children did not have any chronic illness recorded before, which is why it is important to note that pediatric emergencies are hard to predict. Among the known conditions, congenital heart disease and neurological disorders prevailed. The most common causes of mortality were sepsis and respiratory failure, as has been reported elsewhere internationally regarding ED mortality. Multidisciplinary preparedness in pediatric emergency environments is highlighted by the existence of trauma-related and neurological causes.

Discussion:

This study provides a comprehensive analysis of pediatric mortality in the emergency department of Princess Haya Military Hospital under the Jordanian Royal Medical Services (RMS), highlighting several critical challenges. Infants under one year were the most vulnerable group, consistent with global mortality trends [26]. Half of the deaths occurred within the first hour of arrival, reflecting either pre-hospital delays or in-hospital inefficiencies. The leading presenting complaints and causes of death included sepsis, respiratory distress, and seizures. Documentation gaps, particularly the absence of triage data, further impeded timely prioritization and response to critically ill children. Collectively, these findings underscore systemic and clinical shortcomings in pediatric emergency care that warrant urgent attention.

When compared with regional and global data, the results both align with and diverge from established patterns. As in other low- and middle-income countries (LMICs), including Egypt and Lebanon, high early mortality following ED arrival suggests persistent challenges in the rapid recognition and management of life-threatening conditions [27]. The predominance of respiratory failure and sepsis mirrors global findings, where these remain leading causes of pediatric ED deaths [28]. However, the relatively high proportion of undiagnosed or undocumented chronic illnesses in this cohort is concerning, suggesting gaps in primary healthcare follow-up and inadequate medical record integration. The absence of a standardized pediatric triage system-observed in 75% of cases-is less common in high-income countries and underscores a pressing need for reform within RMS facilities.

Clinically, the findings highlight the urgent necessity of strengthening emergency pediatric response systems. Delays in initiating life-saving interventions, particularly beyond the first 15 minutes, may indicate resource limitations or deficiencies in clinical training. This echoes prior

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research pointing to underdeveloped protocols, insufficient simulation-based training, and poor recognition of pediatric early warning signs [29]. Strategies such as implementing standardized triage protocols, deploying rapid response teams, and mandating regular pediatric advanced life support (PALS) training could reduce preventable deaths. Introducing pediatric early warning scores (PEWS) and fostering stronger communication between triage staff and emergency physicians may further enhance the early detection of clinical deterioration [30].

At the systemic level, structural challenges were evident. The predominance of patients from rural areas and the high number of arrivals during off-peak hours suggest weaknesses in primary care accessibility and ambulance response capacity. Additional factors-such as the lack of pediatric-specific policies, inadequate allocation of resources, and ED overcrowding-likely contributed to poor outcomes, consistent with evidence from comparable healthcare systems [5]. Policymakers should consider allocating dedicated funding to pediatric emergency care within RMS hospitals, establishing national training curricula in pediatric emergency medicine, and strengthening referral pathways to ensure critically ill children receive timely care. Aligning national policies with World Health Organization recommendations for pediatric emergency system strengthening could further enhance outcomes [31].

Several limitations should be acknowledged when interpreting these findings. The retrospective design and small sample size (N = 8) limit generalizability. Documentation gaps-particularly concerning triage and detailed clinical timelines-may have introduced bias. Despite these constraints, the study offers valuable insights into gaps in RMS pediatric emergency care. Future research should incorporate caregiver perspectives, evaluate the effectiveness of targeted interventions such as triage training, and conduct multicenter prospective studies. These initiatives are essential for developing a robust, data-driven, and child-centered emergency care system in Jordan.

Conclusion:

The present study examines pediatric mortality in the Princess Haya Military Hospital emergency department (JRMS), identifying infants under one year as the most vulnerable. Nearly half of deaths occurred within an hour of arrival, highlighting critical delays in triage and intervention, alongside broader systemic inefficiencies in pediatric emergency care. These patterns, influenced by national factors such as high ED utilization and limited pediatric specialization, mirror trends in other low- and middle-income countries [32]. This evidence underscores the need for pediatric-specific triage protocols, investments in child-sized equipment and real-time monitoring systems, and mandatory training in pediatric emergency care for frontline staff. Coordinated action by legislators, administrators, and clinicians is essential to establish a

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responsive, well-resourced, child-centered emergency system, enabling Jordan and similar health systems to meet international standards and reduce preventable pediatric deaths.

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