

Epidemiological Profile of Pediatric Vital Emergencies at Laquintinie Hospital of Douala, Cameroon

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Abstract

Introduction: In the absence of health coverage in resource limited-settings, life-saving pediatric emergencies remain a challenge. The objective of our study was to describe the epidemiological profile of life-threatening pediatric emergencies at Laquintinie Hospital in Douala (HLD). **Methods:** A cross-sectional study was carried out for a period of 3 months, from March to May 2017 in the pediatric emergency unit of HLD enrolling all children presenting a life-threatening emergency on admission. Local emergency kits and an internal deferred cost recovery voucher or “green voucher” were used to facilitate access to care for children on admission. The socio-demographic, clinical, therapeutic and evolutionary characteristics were collected and analyzed using SPSS software version 20.0. **Results:** A total of 135 children were enrolled and the sex ratio was 1.54. The mean age was 3.8 years \pm 4.05 and 80.7% of the children were under 5 years old. The majority of children (82.9%) admitted to the emergency room came from peripheral health structures. The hospital prevalence of life-saving emergencies was 42.4%. The mean time to consultation after the onset of symptoms was 5.9 days and 66.0% of admissions were made during the 3 p.m. to 8 a.m. time slot. More than 4/5 of emergencies were neurological, respiratory and cardio-circulatory emergencies representing 35.6% and 18.5% respectively. Severe malaria accounted 31.9% of the etiologies, bronchopneumopathies and meningo-encephalitis were involved in 18.5% and 17.8% of cases respectively. Patients were managed within 30 minutes of ad-

mission in 75.6% of cases and 52.6% of them received a “green voucher”. The average length of stay in the emergency room was 6 days. The death rate from life-threatening emergencies was 17.8% and represented 61.5% of total deaths recorded in pediatric emergencies. **Conclusion:** The profile of life-threatening emergencies at the HLD was that of a child under 5 years old, coming from a peripheral health facility and presenting a neurological emergency.

Keywords

Vital Emergencies, Pediatrics, Douala Laquintinie Hospital, Cameroon

1. Introduction

In 2017, 50% of deaths of children under 5 years old worldwide occurred in sub-Saharan Africa, one in 13 children died before their fifth birthday [1]. Most of these deaths are due to preventable causes such as birth complications, pneumonia, diarrhea, neonatal sepsis and malaria. After the age of 5 years more deaths occur as a result of trauma, mainly caused by drowning and road accidents, children residing in sub-Saharan Africa were 15 times more likely to die than European children [1]. In 2018 in Cameroon, the infant mortality quotient was estimated at 48/1000 [2]. Although emergency medicine is poorly developed in resource-limited setting, visits to emergency departments have increased dramatically in recent years. The Center of Disease Control (CDC) reports an increase of over 35% in emergency room visits in the USA in 2009 compared to 1996 [3]. In France in 2014, the use of emergency services in general would have doubled in 10 years [4]. In previous studies in Africa, infectious pathologies were often found in children under 5 years of age consulting at pediatric emergencies, malaria being the most common etiology. Pediatric emergency unit mortality rates ranged from 8% to 17.3% [5] [6] [7]. Few studies have been conducted on critical pediatric emergencies in a resource-limited setting, especially in Cameroon where no studies were available. To improve mortality due to critical pediatric emergencies, the objective of this work was to describe the epidemiological profile of children with life-threatening emergencies on admission and their evolution.

2. Methods

2.1. Study Type and Location

This is a cross-sectional study carried out by simple consecutive sampling of children aged 1 to 15 years admitted at the pediatric emergency department of the Laquintinie Hospital Douala (LHD) from March to May 2017 (3 months). All children presenting a life-threatening emergency (neurological distress, respiratory distress, cardio-circulatory distress) were included.

2.2. Management and Diagnosis of Life-Threatening Pediatric Emergencies

The emergency unit is headed by 1 pediatrician under whom there are 2 general practitioners, 3 nurses and 7 nursing aids. They work on a permanent basis. Doctors from other units and teams of nurses from the department intervene during duty and on call. The nursing round precedes the medical round, and takes place once a day. The medical doctors on call and the team of nurses take turns from 3 p.m. to 8 a.m. except on public holidays according to a pre-established schedule, this is done under the supervision of a care coordinator and a pediatrician. After identification and vital sign measurements, all patients received at the emergency unit benefit from a rapid assessment of the clinical condition for an adequate referral. All admissions are recorded in a register.

In case of vital distress, “a green voucher” is issued by the doctor. This is receipt issued for internal care that permits deferred payment.

This allows immediate and unconditional access to laboratory and imaging tests, medications and blood transfusion if necessary. It is issued by a doctor after evaluation of the type of emergency and must first be validated at the cash desk to be accepted in the various services requested. Full recovery of care related costs occurs before the child is discharged from the hospital. In the event of proven indigence, the social services of the LHD is contacted.

As soon as the patient is admitted at the emergency unit, conditioning and first aid care is been provided thanks to the emergency kits available and adapted to common pathologies. These kits contain essential drugs and tools for the diagnosis and emergency management of the most frequently encountered pathologies. The emergency kits available concerned pathologies such as: severe anemia, severe dehydration, shock, convulsions, meningitis, malaria, neonatal infection and asphyxia. For any child admitted with a fever $>38.5^{\circ}\text{C}$, the rapid diagnostic test for malaria, HIV, blood sugar and urine test strips. As soon as the patient is clinically stable, he is transferred to a unit suitable for his care.

After doing a pre-test with 10 parents/guardians, the questionnaire was validated. On admission to the pediatric emergency room, an assessment of the child to determine the criticality of the emergency and the parents or legal guardians of all children in life-threatening emergencies were submitted to the questionnaire after giving their consent. Data was collected for statistical analysis.

2.3. Variables Studied

- The socio-demographic characteristics of the parents: age, marital status, level of education, and profession.
- The socio-demographic characteristics of the patients: age, sex, place of residence and provenance.
- The clinical characteristics of the patient: reason for consultation, medical history, physical signs, type of vital emergency, etiological diagnosis, emergency measures, type and time of treatment.

- Evolutionary characteristics: number of hours spent in the emergency room, length of hospital stay in days, hospital mortality rate.

2.4. Operational Terms

Vital emergency: A vital emergency is characterized by the appearance of a distress of a vital function which can lead at any time to cardiac arrest. This emergency therefore calls into question the patient's vital prognosis, that is to say, it designates the patient's risk of death or the chances of survival. **Neurological emergency:** it is a condition causing a more or less complete loss of consciousness of life's relationship functions and a marked vegetative participation of life. **Respiratory emergency or acute respiratory failure** is a syndrome defined as functional lung impairment resulting in hypoxemia, hypercapnia or both and is related to the failure of one or more components of the respiratory system (airways, pulmonary parenchyma, pleura, vessels, respiratory muscles and respiratory control).

Cardio-circulatory emergency: this could be a collapse, hemodynamic shock or cardiopulmonary arrest.

- Collapse is a transient hemodynamic failure, the consequence of an acute and transient imbalance between vascular capacity and blood volume.
- Hemodynamic shock is acute and lasting circulatory insufficiency which impairs tissue perfusion and leads to cellular hypoxia.
- Cardio-circulatory arrest is a sudden interruption of blood circulation in the body, accompanied by ventilatory arrest, loss of consciousness and resulting in the death of the patient. **The green voucher:** internal care voucher with recovery of the costs of deferred care (treatment of patients without delay with payment of the costs of care when the patient is discharged).

2.5. Statistical Analysis

The data were entered and coded in excel 2010 software and analyzed with the SPSS statistics version 23 software. The qualitative variables were expressed in numbers and percentages and the quantitative variables in means and standard deviations.

3. Ethical Considerations

We obtained research authorization No. 0647 of March 01, 2017 from Laquintinie Hospital Douala and ethical clearance from the ethics committee of the University of Douala No. 881/16/2017 /T. Data was collected anonymously and was used only for research purposes

4. Results

Of the 318 patients who were admitted at the pediatric emergency department of the LHD during the study period, 135 patients presented with a life-threatening emergency, giving us hospital prevalence of life-threatening emergencies of 42.4%.

More than 4/5 of emergencies were neurological, 35.6% respiratory emergencies and 18.5% cardio-circulatory emergencies (Figure 1).

4.1. Socio Demographic Characteristics

Infants accounted for 43.7% (59/135) and children aged 5 years and over, 19.3% (26/135) of patients. The average age of the children was 3.8 years with extremes ranging from 82 ± 47 months. Boys represented 60.7% (82/135) of patients and the sex ratio was 1.54 (Table 1).

Patients with a life threatening emergency resided in the Cité des Palmiers health district in 20.0% (27/135) of cases, in the Nylon health district in 16.3% (22/135) of cases and in the Déido health district, where HDL is located, in only 14.1% (12/135) of cases. Most parents or guardians of patients had secondary education; 50.0% (50/100) for fathers and 60.0% (63/105) for mothers. Self-employed fathers constituted 60.0% (60/100) of the sample and 46.6% (43/105) of mothers were unemployed (Figure 2).

Table 1. Distribution of patients according to age and sex.

Variables	Number n	Percentage %
Age ranges, years		
<2 years	59	43.7
[2 - 5 years]	50	37.0
≥5 years	26	19.3
Sex		
Girls	53	39.3
Boys	82	60.7

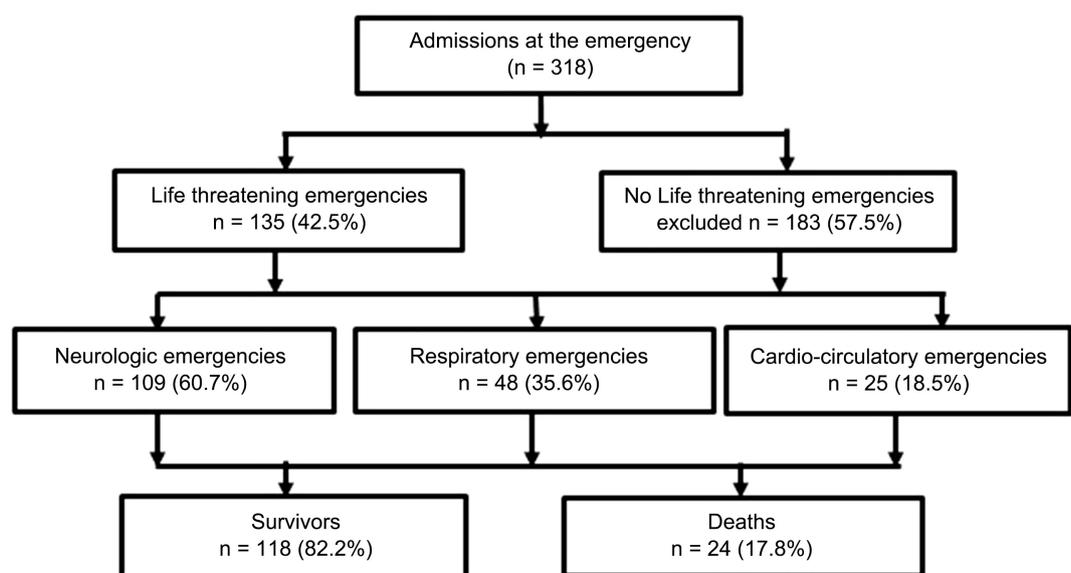


Figure 1. Global presentation of the study results.

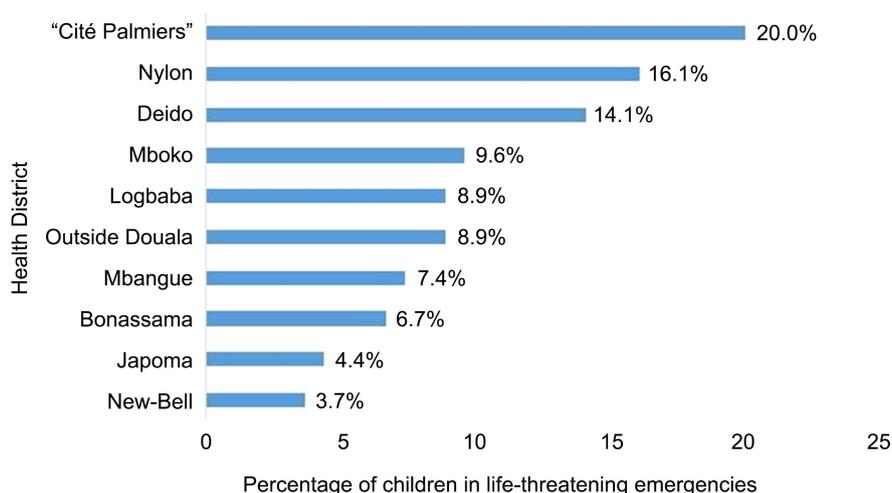


Figure 2. Distribution of children in life-threatening emergencies according to place of residence.

4.2. Clinical Characteristics

4.2.1. Medical History and Reception Conditions on Admission of Life-Threatening Emergencies Patients

More than 3/4 of patients (82.9%, 112/135) admitted for life-threatening emergencies came from another hospital facility and 17.0% (23/135) came from home. The majority of patients (63.0%, 85/100) admitted for life-threatening pediatric emergencies reported having no previous relevant medical history. History of infectious disease accounted for 22% (30/135), neurological disease for 11.0% (15/135) and respiratory disease for 10.0% (13/135) of cases. The mean time to consultation after disease onset was 6.0 days (1-60 days) and the median was 4 days (Table 2).

Of the patients included, 66.0% (89/100) of children in a critical emergency were admitted to the emergency room between 3 p.m.-7:59 a.m. and 71 (52.6%) received an internal care voucher with recovery of deferred cost or “green voucher”. The majority of patients (75.6%; 102/135) were managed within 30 minutes of admission.

4.2.2. Physical Signs on Examination on Admission of Life-Saving Emergencies Patients

More than a third of the patients (34.8%, 46/135) had consulted for seizures, dyspnea represented (25.2%, 34/135) and fever (21.5%, 29/100). The vast majority of patients in life-saving emergencies presented to the emergency unit with a deterioration in general condition resulting in asthenia (77.0%, 103/135), anorexia (64.0%, 86/135) and almost half of the patients mucocutaneous pallor (47.0%, 63/135).

On physical examination, coldness of the extremities 28 (20.7%) and dryness of the mucous membranes 12 (8.9%) were the main cardiovascular signs found on admission of patients. Dyspnea 67 (49.6%) accounted for nearly half of the respiratory signs found, rales and flapping of the wings of the nose were found in

the respective proportions (45.2%; 61/135) and (43.0%; 58/135) while cyanosis was little present (1.5%; 2/135). More than half of the critically ill children presented with seizures 52.6% and 47.4% were admitted in a comatose state (**Table 3**).

4.2.3. Type of Life-Threatening Emergencies and Management at Admission

Neurological pediatric life-threatening emergencies (80.7%, 109/135) dominated the picture with convulsions (47.4%, 64/109) and comas (33.3%, 45/109), followed by respiratory emergencies (35.6%, 48/135) and cardio-circulatory emergencies (18.5%, 25/135), mainly consisting of hypovolemic shock in 15.6% (21/135) of cases. The average length of stay in the emergency room was 2.6 days (min-max: 1 - 44 days). The death rate from life-saving emergencies was 17.8% (24/135). The number of deaths from life-threatening emergencies accounted for more than half (61.5%) of the 39 deaths recorded in the pediatric emergency department (**Table 4**).

Table 2. Medical history of life-threatening emergencies patients.

Variables	Number, n	Percentage, %
Medical history, n = 135		
Unknown medical history	85	63.0
Infectious diseases	30	22.0
Neurological diseases	15	11.0
Respiratory diseases	13	10.0
Cardiovascular diseases	2	1.5
Past surgical history	3	2.2
Drug allergies	1	0.7
Blood transfusion	5	3.7
Delay of consultation, n= 135 (Mean 6,0 days (min-max: 1 - 60 days; SD 8.63)		
≤ 1day	32	23.7
1 - 2 days	11	8.1
3 - 7 days	69	51.1
>7 days	23	17.0
Taking previous treatment before admission		
No treatment	17	13.0
Medical treatment	88	65.0
Medical treatment + phytotherapy	26	19.0
Phytotherapy	4	3.0

4.3. Limitations of Study

The first study carried out on children in life-threatening emergencies, it has enabled us to obtain interesting results for the improvement of medical care. However, it was made that in a single hospital center, this would suggest a caution in the generalization for the interpretation of the results compared to other hospitals although the Laquintinie hospital in Douala is a reference hospital in the city.

Table 3. Physical signs on admission of life-threatening emergencies patients.

Physical signs on admission		
Cardiovascular signs on admission		
Cold extremities	28	20.7
Mucosal dryness	12	8.9
Cardiac murmurs	5	3.7
Lower limb edema	4	3.0
Mottled skin appearance	3	2.2
Cardiac arrest	2	1.5
Respiratory signs on admission		
Dyspnea	67	49.6
Crackles	61	45.2
Flapping of the wings of the nose	58	43.0
Intercostal retractions	52	38.5
Noisy breathing	30	22.2
Paradoxal breathing	26	19.3
Cyanosis	2	1.5
Neurological signs on admission		
Convulsions	71	52.6
Coma	64	47.4
Kernig sign	9	6.7
Nuchal rigidity	8	5.9
Hypotonia	5	3.7
Bulging or depressed fontanel	5	3.7
Brudzinski sign	4	3.0
Paralysis	1	0.7
Babinski sign	1	0.7

Table 4. Type of life-threatening emergencies and management at admission.

Variables	Number, n	Percentage %
Neurological distress		
Convulsion	64	47.4
Coma stage 1	19	14.1
Coma stage 2	11	9.6
Coma stage 3	12	8.1
Coma stage 4	2	1.5
Respiratory distress	48	35.5
Cardiovascular distress		
Hypovolemic shock	21	15.6
Septic chock	1	0.7
Cardio-respiratory shock	3	2.0
Delay in management		
<30 min	102	75.6
30 - 60 min	25	18.5
>60 min	3	2.0
Length of stay at the emergency		
≤1 day	29	21.0
[1 - 2] days	61	45.0
[2 - 3] days	17	13.0
≥3 days	28	21.0

5. Discussion

Our work focused on the epidemiological profile of pediatric life-threatening emergencies (PLTE) and the short-term evolution of patients admitted to the pediatric department at Laquintinie Hospital in Douala. The hospital prevalence of pediatric life-threatening emergencies was 42.4%. Nzame *et al.*, in Gabon (2020), Guedenon *et al.* in Togo (2017) and Kingwengwe *et al.* in DRC (2019), had reported a prevalence of PLTE which varied from 18.3% to 21.4% in their respective previous studies [7] [8] [9].

The high trend in our series could be explained by the geographical location of this referral hospital which has a technical platform to receive patients with serious pathologies on the one hand and on the other hand, access to care is facilitated through the issuance of internal vouchers (green vouchers) with deferred recovery of care costs. In our study, 60.0% of fathers were informal sector workers and 46.7% of mothers were unemployed. A similar trend of precarious employment or parental unemployment reflecting a low socio-economic level was also observed by Fatou Ly in Senegal (2016) [10]. More than 3 out of 5 children

in our study were male and the sex ratio was 1.54. This result was similar to those found by Nzame *et al.* in Gabon, Ly Fatou in Senegal in 2016 and Asse *et al.*, in Ivory Coast (2012). This was unlike results by Enyuma *et al.* in Nigeria (2014) which had found a female predominance [8] [10] [11] [12]. The mean age of the patients was 3.80 years, and children under 5 years of age accounted for 80.7% of patients. This distribution was lower than that found by Guedenon in Togo and higher than that reported in Gabon, Senegal and Morocco, whose proportions varied from 68.8% to 72.7% [8] [9] [10] [13]. The vulnerability to infections, the rapid evolution and the early complications of childhood illnesses common in this age group could explain this situation.

More than 3/4 of patients admitted for life-threatening emergencies came from a peripheral hospital structure and only 17.0% came from their homes. These results were similar to those reported by Roukia *et al.* in Morocco (2019), where 61.2% came from other peripheral health facilities unlike previous studies carried out in Senegal, in Benin and in Cameroon where the majority of patients came from their homes [10] [11] [14] [15]. The reasons given for their choice and the therapeutic course are the perception of the mild disease by the parents at the onset of the symptoms while the persistence and severity of the disease were the main reasons why they ended up going for consultation in health facilities according to Ndukwu *et al.* in Nigeria (2015) [16]. Before arriving at the pediatric emergency department at HLD, 87.4% of patients had received previous treatment. These results were superior to those reported by Penda *et al.* in Cameroon (2017), and Enyuma *et al.* where 74.1% and 50.7% had received self-medication before admission to the pediatric emergency unit, respectively [12] [15]. The mean time to consultation after the onset of the disease was 6.0 days and more than 3/5 of the patients with PLTE were admitted between 3 p.m. - 7:59 a.m. This delay was greater than that found by Penda *et al.*, However it was multiplied by three in the series reported by Ndukwu *et al.* [15] [16]. The long therapeutic course of sick children leads to a delay in consultation due to the underestimation of the severity of the disease by the parents, and ultimately lead to the delay in the diagnosis of emergency situations or complications in downstream health structures. These situations would be detrimental to the survival of the child. Regarding admission times, our results were consistent with those of Enyuma *et al.* and Fatou Ly *et al.* where life-threatening emergencies were mostly received during on-call hours [10] [12]. The most frequent reasons for consultation were seizures, dyspnea and fever. These data were comparable to that found by previous studies [6] [8] [12] [13] [17]. More than 3 in 4 patients with PLTE were treated within 30 minutes of admission. This trend is higher than that reported by other authors [8] [10]. This early management could be explained by the measures put in place in the service to overcome the delay in management with the use of an internal voucher (green voucher) with deferred care cost recovery and local emergency kits. Neurological pediatric life-threatening emergencies dominated the picture with convulsions and comas, followed

by respiratory and cardio-circulatory emergencies. These results were comparable to those found by El Gajoui *et al.* in Morocco (2017) but in different proportions because the respiratory emergencies accounted for nearly half of the cases (45.3%) followed by neurological (25.1%), and cardio circulatory (20.7%) emergencies [19].

The spectacular clinical presentation of the convulsions and respiratory distress could explain the more numerous urgent consultations in our series. The vulnerability of children to these pathologies is thought to be one of the causes of the early development of this type of complications. Severe malaria was the primary etiology of PLTE, as similarly reported by several previous studies [5] [7] [11] [12] [15]-[20]. These results confirm that severe malaria remains the leading cause of morbidity, particularly in children aged 0 - 5 years. In general, infectious pathologies dominate the table of etiologies of vital emergencies in our sample. Pulmonary infectious pathologies took second place and can be compared to the results of Ejlaidi *et al.* and Enyuma *et al.* in Nigeria, where the frequencies of respiratory infections and malaria were comparable (53.7% and 52.4% respectively) [12] [13]. The average length of emergency hospital stay was 2.7 days (min-max: 1 - 44 days), Enyuma *et al.* reported a similar trend in their study in Nigeria [12]. In our series, the pediatric emergency unit received patients until their stabilization. The average length of stay in the pediatric emergency room was 2.7 days (min-max: 1 - 44 days), Enyuma *et al.* reported a similar trend in their study in Nigeria [12]. In our series, the intensive care unit received patients until their stabilization. The death rate from life-saving emergencies was 17.8%. The number of deaths from life-threatening emergencies accounted for more than half (61.5%) of the 39 deaths recorded in the pediatric emergency department. A similar trend was found by Kingwengwe in DRC and Guedenon in Togo [7] [9], lower than that found by Edulu *et al.* in Nigeria but higher in the series of El Gajoui in Morocco [18] [19]. In all these series, mortality more particularly concerned children under 5 years old. These results highlight their great vulnerability to infections at this age.

6. Conclusion

Almost half of the children admitted to pediatric emergencies had a life-threatening emergency. The profile of a life-threatening pediatric emergency is that of a boy, less than 5 years old, coming from a peripheral health facility after having received previous treatment. Infectious pathologies dominated the etiological profile. The very high mortality of life-threatening emergencies could be avoided by setting up staff capacity building, the technical platform and innovative strategies to facilitate the care of patients at a low socio-economic level in our context of limited resources.

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Authors' Contribution

CIP, DKKM and MKL contributed in the conception of this work. CIP, MKL, EBB contributed for data collection and analysis. CIP, EMLM and SBF conceived and wrote the draft manuscript. CIP, SBF, EEC, EMLM and DKKM contributed in proofreading the manuscript.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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