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Paediatric Mortality: Aetiologies and Predictors among Children Aged 1 Month to 15 Years in a Tertiary Hospital in Douala, Cameroon

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Abstract

Background: Children and adolescent mortality remains a public health concern in developing countries. This study aimed to describe risk factors and aetiologies of mortality among children and young adolescents at a tertiary hospital in the town of Douala, Cameroon. **Methods:** We carried out a retrospective cohort study from January 1st to May 31st, 2019 among deceased patients aged 1 month to 15 years admitted to the paediatric ward of the Gynaeco-Obstetric and Paediatric Hospital. Data of interest were collected and analysed. **Results:** Out of 3088 children admitted, 123 death cases were recorded. The overall hospital mortality rate was 3.98%. Females accounted for 51% of the deceased patients. Fever was the main reason for consultation. Severe malaria was the most common diagnosis. In univariate logistic regression analysis, factors associated with mortality included hyperthermia (OR = 0.24; 95% CI 0.80 - 1.33; p = 0.012), coma/impaired consciousness (OR = 0.30; 95% CI 0.10 - 0.88; p = 0.029), pneumonia (OR = 3.95; 95% CI 1.42 -

10.97; p = 0.008), antipyretic therapy (OR = 0.28; 95% CI 0.11 - 0.73; p = 0.009), and no medication (OR = 4.50; 95% CI 1.05 - 9.29; p = 0.043). In multivariate regression analysis, coma/impaired consciousness was found to be the only factor associated with mortality (OR = 6.24; 95% CI 1.15 - 33.73; p = 0.034). **Conclusion:** The present study reveals that most of death cases were due to preventable causes, especially infectious diseases. Efficient reduction in children and adolescent mortality could be achieved by adequately addressing these causes.

Keywords

Children, Young Adolescents, Mortality, Aetiologies, Risk Factors, Cameroon

1. Introduction

Mortality rate is defined as the number of annual deaths relative to the number of inhabitants in a given population [1]. Despite progress made over these last three decades, millions of newborns, children and young adolescents die every year worldwide, mostly due to preventable or treatable causes including infectious diseases and injuries [1]. These deaths largely occurred in developing countries, and are often a reflection of the limited access to basic health interventions such as clean water and sanitation, vaccination, medical treatment, and adequate nutrition [1]. In this context, mortality rates in infants, children and young adolescents are not only key indicators for appraising their well-being, but also more broadly, a surrogate for evaluating level of sustainable social and economic development [2].

According to the World Health Organisation (WHO), the global child mortality rate decreased from 85 to 67 deaths per 1000 live births (LB) between 1990 and 2000. Prevention and reduction of infant-juvenile and young adolescent mortality by two thirds by 2015 was one of the objectives of the Millennium Development Goals. In this regard, many efforts have been made by international and scientific community through development, implementation and scale up of several health interventions. As a consequence, an improvement in survival rates in the above mentioned social groups was noted all around the world [3]-[9].

In Africa, the average child mortality rate is 150 deaths per 1000 LB, which is 8 times higher than those seen in European countries. In Nigeria, estimated mortality rate in children aged <5 years old is 183 deaths per 1000 LB. In resource-constrained countries, reporting of morbidity and mortality health statistics are mainly based on hospital records, given the constraints related to the implementation of community-based investigations [10] [11].

While concerted efforts aimed at improving child survival have led to large reductions in mortality levels among children and young adolescents, persistent and intolerably high numbers of deaths emphasise the need for continuous efforts to reduce mortality in these age groups [12]. The international community

recognizes the crucial need to end preventable child deaths, making it an essential part of the Global Strategy for Women's, Children's, and Adolescent's Health (2016-2030), and the third Sustainable Development Goal (SDG) to ensure healthy lives and promote wellbeing for all people at all ages [12] [13] [14].

Moreover, the risk of death for children aged 5 - 15 years old may be lower than those in younger children. However, preventable death causes such as infectious diseases, drowning, and road injuries are also highly prevalent in children aged 5 - 15 years old. Given the crucial role of education, as well as the associated broader social implications during this important stage of life, the survival and well-being of children and adolescents, and later during their adulthood, should not be ignored [13] [14].

Paediatric mortality is a major public health problem in developing countries, especially in Cameroon. The mortality rate in children under 5 years decreased from 150.7‰ to 144‰, and this is far from the national objectives of 75.8‰ [15]. The present study was designed to provide a comprehensive description of risk factors and aetiologies of death among children aged 5 - 15 years old attending a premium hospital in the town of Douala, Cameroon, where such data are greatly needed. This study will help improve case management and reduce mortality at this level of the health pyramid care.

2. Methods

2.1. Study Design and Setting

A retrospective cohort study was conducted at the paediatric ward of Douala Gynaeco-Obstetric and paediatric Hospital (DGOPH), a tertiary health facility located in town of Douala, Cameroon. The study was conducted for five months from January 1st to May 31st, 2019. The paediatric ward of DGOPH is open for 24 hours a day, from Monday to Sunday. It consists of three units namely 1) the general paediatrics unit, 2) the neonatology unit, and 3) the external consultation unit. The staff of the paediatric ward includes five paediatricians (05), five general practitioners (05), nineteen nurses (19), and five caregivers (05).

Children in distress are managed at the emergency room of the general paediatric unit, and then are transferred to hospitalization rooms after their stabilization. Four beds are present in the emergency room in which three staff members (one medical doctor and two nurses) work permanently. Each bed is equipped with a multi-parameter monitor and oxygen therapy device. The hospital has a medical biology laboratory, video electroencephalography (video-EEG), and medical imaging service with a computed tomodensitometry module.

2.2. Study Population

Medical records of deceased children aged 1 month to 15 years old of both sexes were included in the study. Medical records with no admission date, date of death, medical observation, and poorly reported hospital evolution data were excluded from the study. A minimum sample size of 44 individuals was required

for the study based on the Lorentz's formula and data on children's mortality rate (2.95%) from the same region [15] where our study was conducted.

2.3. Data Collection

A questionnaire form was used to collect data of interest from patients' medical records. These data included sociodemographic characteristics and past history of the deceased children (age, gender, origin, residence, and immunisation status), clinical data (reasons for consultation, date and month of admission, date of death, the delay from admission to death, diagnosis at entrance based on clinical features and laboratory, radiological and electrophysiological analyses, intra-hospital complications, treatment, aetiologies of death), and risk factors of death.

2.4. Definition of Terms

- Hypothermia: body temperature less than 36.5˚C.
- Hyperthermia: body temperature ≥ 38˚C.
- Hypotension: a blood pressure (mmHg) ≤ 80-105/55-70 in toddlers, ≤ 90-105/60-70 in infants, ≤ 95-119/60-76 in children, and ≤ 110-124/70-80 in teenagers.
- Hypertension: a blood pressure (mmHg) ≥ 80-105/55-70 in toddler, ≥ 90-1050/60-70 in infant, ≥ 95-119/60-70 in children, and ≥ 110-124/70-80 in teenager.
- Tachycardia: a pulse ≥ 120 in toddler, ≥ 115 in infant, ≥ 110 in children, and ≥ 100 in teenagers.
- Bradycardia: a pulse ≤ 80 in toddler, ≤ 75 in infant, ≤ 70 in children, and ≤ 60 in teenager.
- Bradypnea: respiratory rate ≤ 30 in toddler, ≤ 24 in infants, ≤ 22 in children, and ≤ 18 in teenager.
- Polypnea: respiratory rate ≥ 60 in toddler, ≥ 40 in infant; ≥35 in children, and ≥ 30 in teenager.
- Coma: Glasgow coma scale; Stage I = ≤ 4, Stage II = 5 - 7, Stage III = 8 - 10, Stage IV = 11 - 14 and for the Blantyre score; Stage I = 4, Stage II = 3 - 2, Stage II = 1, Stage IV = 0.
- Anaemia: haemoglobin level < 12 g/dL, and which was further classified into mild (10 - 11 g/dL), moderate (8 - 9 g/dL), and severe (≤7 g/dL).
- Circumstances of death were the aetiologies of death found in the medical records.

2.5. Statistical Analysis

Data were keyed into an Excel 2016 spreadsheet, and then exported to the statistical package for social sciences (SPSS) v20 for Windows (SPSS, IBM, Inc., Chicago, IL, USA) and GraphPad v5.03 for Windows (GraphPad PRISM, San Diego, CA, USA). Qualitative and quantitative variables were presented as percentages

and mean ± standard deviation, respectively. Pearson chi square test was used to compared proportions while univariate and multivariate logistic regression analyses were used to identify risk factors of mortality. Odd ratio (OR) and their confidence interval at 95% (95% CI) were computed to measure the strength of association between independent variables and dependent variable (*i.e.*, mortality rate). The different independent variables tested in logistic analysis were sociodemographic (age, gender and origin), reasons for consultation, vital parameters (temperature, pulse, respiration rate, SaO_2), neurological status (Glasgow and Blantyre findings), biological parameters (C reactive protein, transaminases, urea, creatine and blood count), diagnosis on admission, hospital complications, and treatment administered. Only independent variables for which *p*-value was ≤0.20 in univariate logistic model were included in the multivariate logistic model. Statistical significance was set at *p*-value < 0.05.

2.6. Ethical Considerations

This study has received the approval of the ethics committee of the University of Douala (N° 2019/0014/HGOPED/DG/CEI). Administrative approval was obtained from The Director of the DGOPH. The information obtained from the deceased children records were used according to the strict respect of confidentiality.

3. Results

A total of 3088 patients were admitted at the paediatric ward of the DGOPH during the study period. One hundred and twenty-three were eligible for the study, 23 of them were excluded from the study as per the above mentioned exclusion criteria. Finally, 100 patients were eligible for the study as depicted in Figure 1.

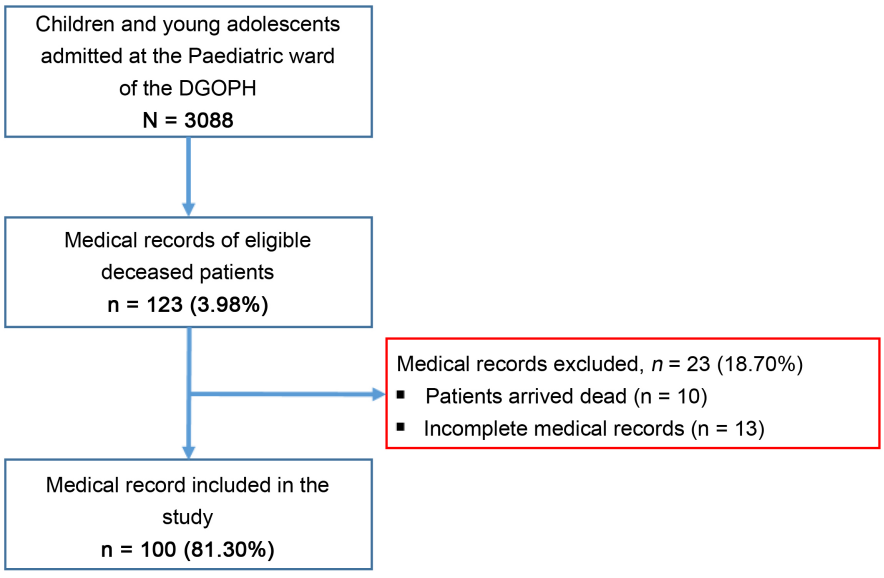

Figure 1. Flow diagram depicting the inclusion of patients' medical records.

3.1. Year-Wise Mortality Trend and Sociodemographic Characteristics

The evolution of mortality rate from September 1st 2015 to April 31st 2019 is presented in Figure 2. The number of deaths was highest during the year 2018 while no death case was recorded in 2015. Besides, mortality rate before 24 hours was higher than those reported after 24 hours irrespective of the year (Figure 2).

A total of 100 patients were included in the study. Half of them were aged 6 - 12 years, with a mean age of 6 ± 3 years old. Female accounted for 51% of the patients (Table 1). Most of the patients were referred to the DGOPH (66.0%), were coming from popular areas (62.0%), and had updated immunization status (77.0%) (Table 1).

3.2. Reasons for Consultation

A large number of reasons for hospital consultation were recorded in this study. Fever (64.0%), respiratory distress (44.0%), fatigue (31.0%), convulsions (29.0%), and coma/impaired consciousness (29.0%) were the main reasons (Table 2).

3.3. Vital Parameters, Neurological Status and Diagnosis on Admission

On admission, most of the children presented with hyperthermia (72.2%), Polypnea (85.5%) and tachycardia (82.1%) (Table 3). Based on the Blantyre score, 44.6% and 19.6% of the patients had level of consciousness graded stage II and III, respectively. Besides, the main causes of diagnosis on admission included severe malaria (42.0%), pneumonia (27.0%), severe dehydration (16.0%), and septic shock (16.0%) (Figure 3).

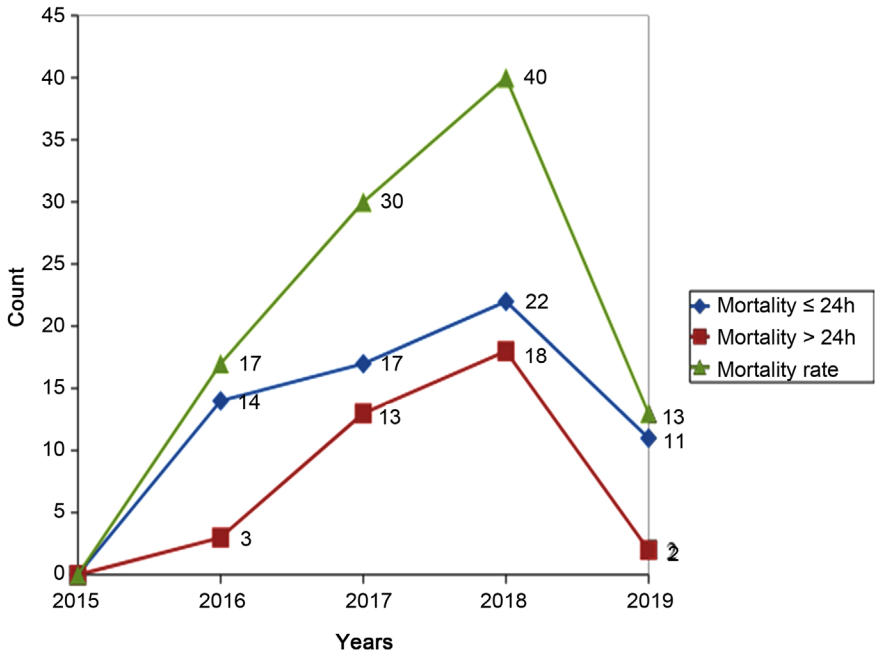

Figure 2. Evolution of paediatric mortality between 2015 and 2019.

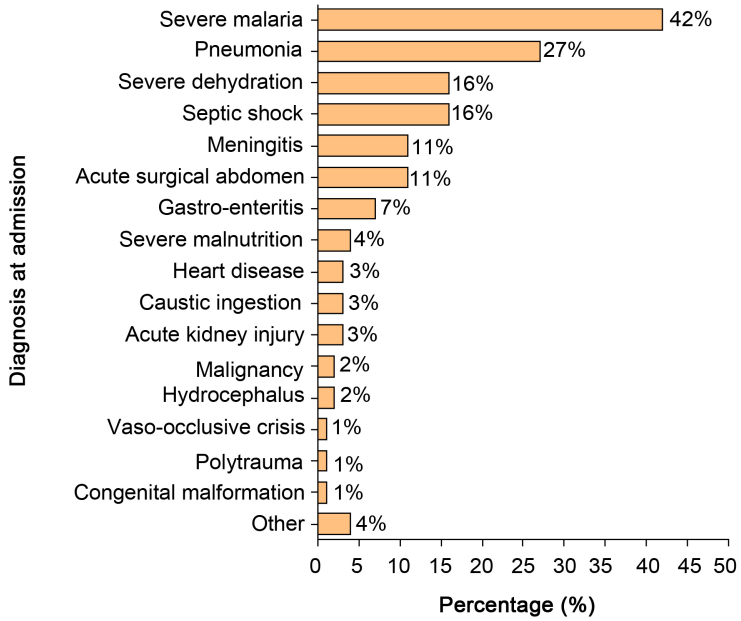

Figure 3. Diagnosis on admission.

Table 1. Sociodemographic characteristics and past history of the deceased children.

Variables	Categories	Frequency $n = 100$	Percentage (%)
Age	1 month - 2 years	15	15.0
	3 years - 5 years	31	31.0
	6 years - 12 years	50	50.0
	13 years - 15 years	4	4.0
Gender	Female	51	51.0
	Male	49	49.0
	Female to male ratio	1.04	
Origin	Home	34	34.0
	Referred	66	66.0
Residence	Popular area	62	62.0
	Residential area	32	32.0
Immunization	Not specified	6	0.6
	Outdated	3	0.3
	Updated	77	77.0
No immunization	Not specified	20	20.0
	Outdated	20	20.0
	Updated	2	2.0
	Human immunodeficiency infection	1	1.0
	Sickle cell disease	1	1.0
	Haemophilia	1	1.0
	Others	7	7.0

Table 2. Reasons for consultation.

Reasons for consultation	Frequency $n = 100$	Percentage (%)
Fever	64	64.0
Respiratory distress	44	44.0
Fatigue	31	31.0
Convulsion	29	29.0
Coma/Impaired consciousness	29	29.0
Pallor	22	22.0
Diarrhoea	18	18.0
Cough	15	15.0
Vomiting	13	13.0
Abdominal pain	11	11.0
Emaciation	9	26.5
Rectorragia	6	17.6
Others	5	14.7
Trauma	3	3.0
Constipation	3	8.8
Headache	1	1.0
Chest pain	1	1.0
Oedema	1	1.0
Hematemesis	1	1.0

The sum of percentage exceeds 100% as a patient could have more than one reason.

3.4. Aetiologies of Deaths

As depicted in Figure 4, eight causes were identified as responsible for deaths of patients. The main death aetiology was decompensated septic shock (32.0%). It should be noted that more than one third of deaths were due to aetiologies of unknown origin (Figure 4).

3.5. Factors Associated with Mortality

In the univariate logistic regression analysis, a total of six factors were found to be statistically associated with mortality, and these included coma/impaired consciousness; elevated temperature, abnormal level of C reactive protein, pneumonia, absence of medication, and the administration of antipyretic therapy. The risk of death was about five times (OR = 4.50, 95% CI 1.05 - 9.29, p = 0.043) higher in patients having received no medication compared to their counterparts under therapy. Only the presence of coma/impaired consciousness factor was significantly associated with mortality in the multivariate logistic regression analysis. Patients diagnosed with coma/impaired consciousness had a six times higher mortality risk as compared to those with normal consciousness (OR = 6.24, 95% CI 1.15 - 33.73, p = 0.034) (Table 4).

Table 3. Vital parameters and neurological status on admission.

Variables	Categories	Frequency	Percentage (%)
Vital parameters*			
Temperature (n = 97)	Hypothermia	10	10.3
	Normothermia	17	17.5
	Hyperthermia	70	72.2
Respiration rate (n = 62)	Bradypnea	1	1.6
	Normal	8	12.9
	Polypnea	53	85.5
Blood pressure (n = 4)	Hypotension	2	50.0
	Hypertension	2	50.0
Pulse (n = 78)	Bradycardia	4	5.1
	Normal	10	12.8
	Tachycardia	64	82.1
SaO_2 (n = 50)	Abnormal	34	68.0
	Normal	16	32.0
Neurological status*			
Glasgow score (n = 12)	Normal	4	33.3
	Stage I	0	0.0
	Stage II	3	25.0
	Stage III	2	16.7
	Stage IV	3	25.0
Blantyre score (n = 56)	Normal	18	32.2
	Stage I	1	1.8
	Stage II	25	44.6
	Stage III	11	19.6
	Stage IV	1	1.8

*Missing data were noted for these variables.

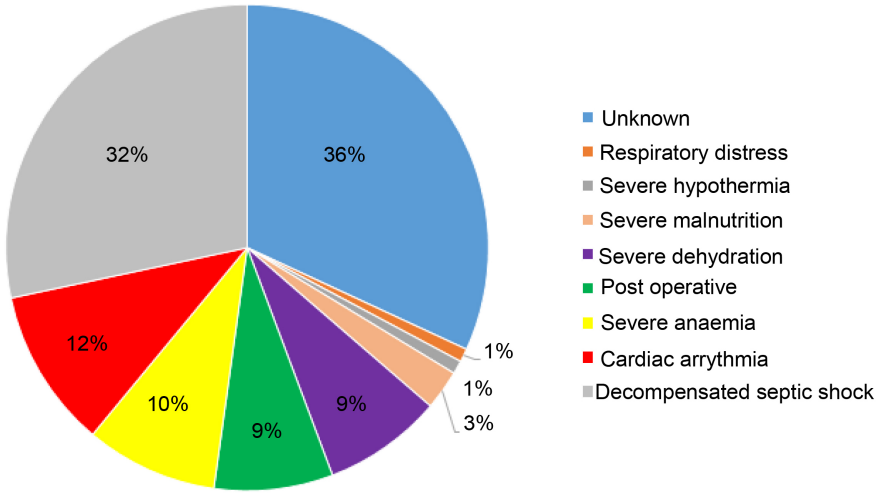

Figure 4. Prevalence of different aetiologies of deaths.

Table 4. Factors associated with mortality.

Factors	Categories	OR (95% CI)	*p*
Univariate analysis#			
Coma/Impaired consciousness	No	1	
	Yes	0.30 (0.10 - 0.88)	0.029*
Temperature	Normal	1	
	Hypothermia	2.88 (0.74 - 11.14)	0.656
	Hyperthermia	0.24 (0.80 - 1.33)	0.012*
SaO_2	Normal	1	
	Abnormal	2.52 (0.71 - 8.96)	0.151
C reactive protein	Normal	1	
	Abnormal	0.33 (0.11 - 0.95)	0.041*
Pneumonia	No	1	
	Yes	3.95 (1.42 - 10.97)	0.008*
Persistent cough	No	1	
	Yes	3.62 (0.81 - 6.18)	0.092
No medication	No	1	
	Yes	4.50 (1.05 - 9.29)	0.043*
Antipyretic therapy	No	1	
	Yes	0.28 (0.11 - 0.73)	0.009*
Multivariate analysis			
Temperature: ≥38˚C	-	1.32 (0.10 - 18.37)	0.837
C reactive protein: Abnormal	-	2.01 (0.60 - 6.67)	0.256
Pneumonia: Yes	-	2.33 (0.66 - 8.27)	0.189
No medication: Yes	-	8.63 (0.40 - 187.09)	0.170
Antipyretic therapy: Yes	-	0.83 (0.14 - 4.78)	0.836
Coma/Impaired consciousness: Yes	-	6.24 (1.15 - 33.73)	0.034*

Univariate and multivariate logistic regression test was used to identify associated factors; OR: Odd ratio, 95% CI: Confidence interval at 95%; #Factors for which *p*-value was below 0.20 in the univariate logistic analysis; *Statistically significant at *p*-value < 0.05.

4. Discussion

We conducted a retrospective, descriptive and analytical study at the DGOPH, a tertiary hospital in the town of Douala, Cameroon. The study was aimed at describing aetiologies and identifying risk factors associated with mortality among children and young adolescents.

4.1. Sociodemographic Characteristics

- **Trend of Mortality by Year**

Mortality rates were highest during the year 2018 while no deaths were recorded during the year 2015. The hospital started to be functional in 2015, and this is likely the main reason of why no death cases were observed at the hospital. Other factors including the relatively high cost of cares in this hospital and

its difficult access could also explain this finding.

- **Population Distribution by Gender**

Females accounted for more than half of the study population. However, mortality rates were higher in males as compared to females, despite the fact that no statistically significant difference was found. This male predominance among death cases is consistent with findings from previous studies in Togo [16] [17] [18] [19]. Biological factors including genetic, hormonal and anatomical aspects could explain this mortality rate excess observed in males.

- **Population Distribution by Age**

Half of children were aged 6 - 12 years old in this study. In contrast, mortality cases were mainly observed in children aged 3 to 5 years. This is in line with previous studies and WHO statistics, and this finding confirms that children under five years still remain the most vulnerable group to morbidity and mortality [12] [13] [20].

- **Population Distribution by Origin and Residence**

In our study population, most of the children who died were referred (66%), and this could be owing to the fact that DGOPH is a reference hospital and receives children coming from health facilities with poor care services. This agrees with results by Ayoola *et al.* (2005) in Nigeria [3]. Mortality rates were highest in children from populous districts of Douala. This result is not surprising as poverty is an important contributor to mortality risk in all age groups, especially in children. Poverty implies more difficulties to access care services in an easy and rapid way, and increased risk of infectious diseases due to lack/poor sanitation. In addition, low income hinders the usage of health services, and negatively affects the nutrition of children [10].

- **Clinical and Paraclinical Presentation of the Deceased Children**

Fever was the principal reason for consultation and associated with mortality. In addition, impaired consciousness was also significantly associated with child mortality. Convulsions are often caused by hyperthermia which can lead to loss or impairment of consciousness (coma). Abnormal CRP levels were associated with reduced mortality risk. This finding is surprising and could be explained by the fact that several conditions including infections can elicit increased CRP levels [21]. To be noted, infections as malaria are a common cause of hyperthermia [22] [23] [24].

4.2. Mortality and Predictive Factors

- **Mortality according to Diagnosis on Admission**

The present study points out that the main life-threatening conditions are not necessarily those that are responsible for most of mortality cases. Indeed, severe malaria was mainly associated with morbidity while pneumonia was mainly responsible for death cases. This finding is consistent with that by Duboz and colleagues in Congo Brazzaville. In highly malaria endemic areas as Cameroon, children are frequently exposed to infecting bites of the malaria parasites mosquito vectors. They develop an acquired immunity also known as "premonition"

that protect them from the severe forms of the disease, and thus explains the low share of mortality due to malaria in such areas [25] [26].

- **Mortality according to Intra-Hospital Complications and Treatment Received**

None of the different intra-hospital complications was found to be associated with mortality. Antipyretic-based therapy was associated with mortality, and this supports the hypothesis that hyperthermia is a natural response to infection, and thus the administration of antibiotics is beneficial to septic patients. This finding is in opposition to that from a previous study that found no reduction in mortality risk in septic patients treated with antibiotics [27].

- **Aetiologies of Deaths**

There was no significant correlation between mortality and the different causes of death. More than one third of the children had an unknown circumstance of death, and this is due to not reporting death cause in medical records. This is a common problem seen in health facilities of developing countries, especially those from the public sector. Decompensated septic shock was the second cause of death. This finding points out that infectious diseases are important cause of childhood illnesses and mortality.

- **Predictive Factors of Mortality**

As briefly above mentioned, coma/impaired consciousness was predictor of child mortality, and this is consistent with previously conducted studies in Africa and Asia [28] [29] [30] [31] [32].

4.3. Limitations of the Study

The main limitation of our study is that it was a single centre study, and this context the findings cannot be extended at the country level. Furthermore, the lack of pathological confirmation of death causes might have affected some of the probable death aetiologies. Finally, socioeconomic status data were not captured in the present study, and thus we were unable to make a yet more detailed analysis of risk factors of child mortality.

5. Conclusion

This study outlined that fever was the main reason for consultation, and severe malaria accounted for most of diagnosis on admission. Decompensated septic shock was the main cause of mortality. Factors associated with mortality included coma/impaired consciousness, hyperthermia, pneumonia, antipyretic therapy, and the absence of medication. Most of the deaths in children and young adolescents were due to preventable causes, especially infectious diseases. This suggests that reduction in mortality rate in children and young adolescents can be achieved by efficient management of these underlying causes.

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and Pediatric Hospital, Douala, Cameroon.

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- **Conception and design:** Daniele Kedy Koum, Calixte Ida Penda, Christiana Mpongo Moukongo, Emile Telesphore Mboudou, Paul Koki Ndombo.
- **Acquisition of data:** Christiana Mpongo Moukongo, Daniele Kedy Koum, Diomede Noukeu, Dominique Enyama.
- **Analysis and interpretation:** Daniele Kedy Koum, Loick Pradel Kojom Foko, Dominique Enyama, Mbono Rhita, Laurent Mireille Endale.
- **Drafting/Revising the manuscript:** Daniele Kedy Koum, Laurent Mireille Endale, Henri Essome, Loick Pradel Kojom Foko, Cecile Okalla Ebongue, Charlotte Eposse, Patricia Epée Eboumbou.
- **Final approval of the version:** all the authors.
- **Agreement to be accountable for all aspects of the work:** Daniele Kedy Koum, Emile Telesphore Mboudou, Paul Koki Ndombo.

All the authors of the manuscript have read and agreed to its content and are accountable for all aspects of the accuracy and integrity of the manuscript.

Conflicts of Interest

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

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Supplementary File 1. Questionnaire Form

N^0 Sheet ……. N^0 Registered of death…….....

Date of inclusion: …… /……. / 2019

I. IDENTIFICATION

1) Name & surname: …….

2) Date of birth (DD/MM/YYYY): …… /……. / …….

3) Age (in month or in year): ……

4) Date of admission: ……. /……. / …….

5) Time of admission: ……...

6) Date of death ……. /……../……

7) Time of death: ……

8) Delay of death from admission (in days or hours): ……

9) Month of death: □Jan, □Feb, □Mar, □Apr, □May, □Jun, □Jul, □Aug, □Sep, □Oct, □Nov, □ Dec

10) Age groups of death: 1 month - 2 years (toddler), 3 years - 5 years (infant), 6 years - 12 years (child) and 13 years - 15 years (teenager)

11) Gender: □ M □ F

12) Origin: □ Home □ Referred

II. REASONS FOR CONSULTATION

1) Fever	□ Yes	□ No
2) Headache	□ Yes	□ No
3) Cough	□ Yes	□ No
4) Chest pain	□ Yes	□ No
5) Abdominal pain	□ Yes	□ No
6) Fatigue	□ Yes	□ No
7) Pallor	□ Yes	□ No
8) Respiratory distress	□ Yes	□No
9) Diarrhea	□ Yes	□ No
10) Vomiting	□ Yes	□ No
11) Edema	□ Yes	□ No
12) Convulsion	□ Yes	□ No
13) Coma/ impaired consciousness	□ Yes	□ No
14) Trauma	□ Yes	□ No
15) Congenital malformation	□ Yes	□ No
16) Other reasons for consultation	□ Yes	□ No

17) If Yes, specify……...

III. MEDICAL HISTORY

18) HIV	□Yes	□ No
19) Hemophilia	□ Yes	□ No
20) EPI	□ Yes	□ No
21) Out EPI	□ Yes	□ No

22) Others……...

IV. INPUT PARAMETERS

1) Vital parameters:

Temperature (˚C) …… Pulse(pulse/min) …….

Blood pressure (mmHg)……...Respiratory rate (breath/min) ……

Glasgow (15) …… Blantyre (5) ……... SaO_2(%) ……

2) Anthropometric parameters:

Weight (Kg)……... Height(m)……...

head circumference(cm)…….

MUAC (cm)……... W/H……...

V. INPUT DIAGNOSTIC (reasons for hospitalization)

1) Severe malaria	□ Yes	□ No
2) Severe malnutrition	□ Yes	□ No
3) Severe dehydration	□ Yes	□ No
4) Meningitis	□ Yes	□ No
5) Acute abdomen	□ Yes	□ No
6) Pneumonia	□ Yes	□ No
7) Sickle cell anemia	□ Yes	□ No
8) Respiratory tract infection	□ Yes	□ No
9) Urinary tract infection	□ Yes	□ No
10) Intracranial hemorrhage	□ Yes	□ No
11) Tetanus	□ Yes	□ No
12) Septicemia	□ Yes	□ No
13) Caustic ingestion	□ Yes	□ No
14) Others	□ Yes	□ No

15) If yes, precise……...

VI. LABORATORY ANALYSIS AND MEDICAL IMAGING

1) Blood glucose level:	□ Yes □ No
2) If yes, highest blood glucose level during hospitalization: …… (g/L)	
3) CRP:	□ Yes □ No
4) If yes, highest CRP level during hospitalization: ……. mg/L	
5) Full blood count:	□ Yes □ No
6) If yes, lowest hemoglobin level during hospitalization: ……g/dL	
7) Tick drop:	□ Yes □ No
8) If yes, tick drop:	□ Positive □ Negative
9) Serum electrolytes:	□ Yes □ No
10) If yes, abnormalities:	□ Yes □ No
11) HIV test:	□ Yes □ No
12) If yes, test:	□ Positive □ Negative
13) Cerebral spinal fluid analyzed:	□ Yes □ No
14) If yes, abnormalities	□ Yes □ No
15) Dipstick:	□ Yes □ No
16) If yes, abnormalities	□ Yes □ No
17) Abdominal scan:	□ Yes □ No
18) If yes, abnormalities	□ Yes □ No
19) EEG:	□ Yes □ No

20) If yes, abnormalities: □ Yes □ No
21) Cerebral scan: □ Yes □ No
22) If yes, abnormalities: □ Yes □ No
23) TFE: □ Yes □ No
24) If yes, abnormalities: □ Yes □ No
25) Chest X-ray: □ Yes □ No
26) If yes, abnormalities: □ Yes □ No
27) Others analysis □ Yes □ No
28) If yes, details…….

VII. EVOLUTION (during hospitalization)

-Parameters:

A. Vital parameters:

Temperature (˚C) …… Pulse (pulse/min) …….

Blood pressure(mmHg) ……. Respiratory rate (breath/min) ……...

Glasgow (15) ……. Blantyre (5) ……SaO_2(%) ……

B. Anthropometric parameters:

Weight (Kg) …… Height(m) ……... Head circumference (cm) …….

MUAC (cm) …… W/H ……...

Complains:

1) Persistent fever □ Yes □ No
2) Persistent cough □ Yes □ No
3) Persistent edema □ Yes □ No
4) Persistent headache □ Yes □ No
5) Persistent abdominal pain □Yes □ No
6) Persistent fatigue □ Yes □ No
7) Persistent pallor □ Yes □ No
8) Persistent vomiting □Yes □ No
9) Persistent diarrhea □ Yes □ No
10) Persistent seizure □ Yes □ No
11) Another significant event □Yes □ No
12) If yes, specify ……

VII. TREATMENT

a.) <u>Non-medicated means</u>

1) Rehydration □ Yes □ No
2) Blood transfusion □ Yes □ No
3) Oxygenation □ Yes □ No
4) Reanimation □ Yes □ No
5) Nursing □ Yes □ No
6) Monitoring □ Yes □ No

b.) <u>Therapeutics used</u>

7) Antibiotic □ Yes □ No
8) Antipyretic □ Yes □ No
9) Anti-malarial drugs □ Yes □ No
10) Anti-epileptic drugs □ Yes □ No

11) Surgery □ Yes □ No
12) No medication □ Yes □ No
13) If yes, why……
14) Others □ Yes □ No
15) If yes, details……

VIII. ETIOLOGIES OF DEATH

1) Severe anemia □Yes □ No
2) Severe dehydration □ Yes □ No
3) Decompensated septic shock □ Yes □ No
4) Severe malnutrition □ Yes □ No
5) Intracranial hemorrhage □ Yes □ No
6) Cardiac arrhythmia □ Yes □ No
7) Post-operative □ Yes □ No
8) Post blood transfusion □ Yes □ No
9) Cause of unknown dead □ Yes □ No
10) Other causes of death □ Yes □ No

If Yes, specify: ……