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Morbidity and Mortality in the Emergency Department of the Albert Royer National Children's Hospital Center Dakar: Prospective Study from January 1 to April 30, 2020

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Abstract

Introduction: Infant and child morbidity and mortality constitute a public health problem in Africa, particularly in Senegal. The objective of this work was to help identify the determinants this morbidity and mortality. **Materials and Methods:** A prospective study, over a 4-month period (January to April 2020). All patients aged 0 to 15 years, hospitalized for emergency reasons in the Albert Royer emergency department, were included. Mortality was analyzed according to sociodemographic data, the patient's itinerary, transfer procedures, availability of emergency medications, diagnosis made during hospitalization and causes of death. The data were collected based on a protocol in an established file and analyzed by SPSS (Statistical Package for Science Social) software. Version 18. **Results:** 225 children in emergency situations were included. The age of our patients is between 0 and 15 years (minimum 0.23 months, maximum 191 months, average 47 months and standard deviation 54). Thus, emergencies represented 57.98% of the 388 hospitalizations. Seventy percent of patients were less than 60 months old with a male predominance (sex ratio 1.16), 2.22% were newborns and 27.11% were aged between 60 and 191 months). A total of 79 (35.1%) were transferred and only 57.4% received care before transfer. A total of 12 deaths were reported, representing a lethality of 5.3%. Only young age (less than 59 months, a mortality rate of 91.7%), cardiac decompensations, severe sepsis, and neonatal conditions were more associated with mortality. The majority of our deceased patients came

from families with a low socio-economic level (83.3%). **Conclusion:** Pediatric emergencies are frequent and responsible for lethality and require the necessary efforts, particularly through parent education, the creation of emergency outpatient care units and, above all, the strengthening of the technical platform and therapeutic means.

Keywords

Morbidity, Mortality, Emergencies, Infant and Juvenile

1. Introduction

Pediatric emergencies constitute a set of morbid conditions threatening the life of the child in a more or less short term, requiring rapid and adequate treatment [1].

Every year, millions of children die, most often from preventable or treatable illnesses. To address this situation, the world has made considerable progress in reducing child mortality in recent years.

Globally, the under-five mortality rate increased from 93 deaths per 1000 live births in 1990 to 41 in 2016 and 38 in 2019. This equates to 01 in 11 children dying before reaching the age of 05 years in 1990 compared to 01 children in 27 in 2019 [2].

This remarkable progress in improving child survival since 2000 has saved the lives of 50 million children under the age of 5 around the world.

In France, between 1901 and 1909 the infant mortality rate stood at 143 per thousand births, in 1965 it was 21.9 and since 2005, this rate has fluctuated around 3.7%.

If on a global scale, progress has accelerated in reducing the mortality rate among children under 05 years old, there is a difference between the mortality of children under 05 years old between regions and countries.

India, Nigeria, the Democratic Republic of Congo, Pakistan and China have the highest number of deaths among children aged 5 to 9 years.

Sub-Saharan Africa remains the region where the under-5 mortality rate is the highest in the world with 1 in 13 children dying before their fifth birthday, 20 years less than the world average which reached a rate of 1 in 13 in 1999 [2]. At the National Hospital Center of Cotonou (Benin), and out of 2818 cases of hospitalizations, 60% were in an emergency situation [3]. At the Libreville Hospital Center (Gabon), pediatric emergencies represent 27% of admissions to the service with an overall mortality rate of 9% [4] In Mali, the main etiologies mentioned by TRAORE A. are: severe malaria and complicated (33.7%), severe dehydration by gastroenteritis (18.4%), followed by pneumonia, neonatal infections, and meningitis.

Mortality in pediatric emergencies is due to several factors that are most often intertwined, the economic precariousness of populations, late seeking care and inadequate care in pre-hospital medical centers [5]. Mastering these factors constitutes a

major asset for achieving sustainable development goals SDG number 3 "aims to ensure good health and well-being for the entire population".

In Senegal in 2002 NDIAYE *et al.* recorded during their study a mortality rate of 26.10% among children aged 0 to 15 years [6].

According to the 2020 EDS: Overall, the risk of infant and child mortality, that is to say, the risk of death before the age of five, is 37% [7].

The objective of the government of Senegal is to reduce this infant and child mortality to 20 per 1000 live births according to SDG 3.2.1. [8] by 2030.

Reducing the mortality rate requires the construction of infrastructure, the acquisition of the equipment necessary for adequate management of emergencies and the continuing training of personnel [9] [10].

The case of the HEAR emergency department made functional in 2019, the identification of the determinants of morbidity and mortality after construction therefore proves essential.

This is what justifies our study including:

The general objective is to analyze the determinants of morbidity and mortality of patients aged 0 to 15 years, hospitalized in this new emergency department during the study period.

Specific objectives

- Determine the frequency of hospitalizations in the emergency department.
- To determine the sociodemographic characteristics of patients hospitalized in the emergency department.
- Identify the different etiologies of pediatric medical emergencies in the SAU.
- Identify the most common causes of mortality as well as the population at high risk of death.
- Determine the overall pediatric mortality rate in the SAU.

2. Materials and Methods

Methodology

Type, duration and period of study

This is a prospective, descriptive and analytical study that involved 225 hospitalized patients. The study took place from January 1 to April 30, 2020, so it lasted 4 months.

Study population

The study population concerned patients aged 0 to 15 years old, in an emergency situation, hospitalized in the SAU.

- **Inclusion criteria**

We included in the study all emergency patients, aged 0 to 15 years at admission, hospitalized in the department during the period of our study. They were eligible regardless of the reason for hospitalization.

- **Non-inclusion criteria**
- Children who died outside the service before admission (death on arrival).
- Patients hospitalized outside of emergency (other reasons).

Data collection

The data was collected using a questionnaire established by the doctor responsible for the study who is none other than the study manager and made available to the on-call team.

We stopped the study at 4 months because of the measures linked to the appearance of COVID-19, only the minimum service that was authorized was functioning and there was a drop in attendance.

Sorting involves quickly assessing sick children when they arrive at the hospital and putting them into one of the following groups: Those who have EMERGENCY SIGNS and require emergency treatment immediately. NON-URGENT cases, which show neither signs of urgency nor signs of priority [10]. Emergency medications were considered available when they were present in the doctor's on-call kit when the patient was hospitalized.

We collected and analyzed the following parameters:

- Sociodemographic: age, sex, socio-economic level, geographical origin;
- Clinics: referral, self-referral, reasons for consultation, degree of sorting, diagnosis on arrival and discharge;
- Therapeutic data;
- Scalable data.

Data analysis

The data was collected based on a protocol in an established file. The entry is made with the SPHINX v5 software.

The statistical analysis was carried out using SPSS (Statistical Package For Social Sciences) Version 18 software.

Tables and graphs were made using Microsoft Excel.

Quantitative variables were expressed as mean and standard deviation; qualitative variables in percentage.

3. Results

3.1. Attendance at the Reception and Emergency Service

Morbidity of patients in emergency situations:

Frequency: During the study period from January 1 to April 30, 2020, 10,598 patients were seen in consultation at the SAU. Among these 388 were hospitalized, representing a proportion of 3.66% hospitalization. Emergency rooms accounted for 225 patients among those hospitalized: 57.98%.

Distribution of patients according to emergency:

Emergencies accounted for 57.98% of SAU admissions through urgency and 42, 02% are not urgent (**Figure 1**).

3.2. Sociodemographic Characteristics of Patients

3.2.1. Age of Patients

The age of our patients is between 0 and 15 years (minimum 0.23 months, maximum 191 months, average 47 months and standard deviation 54). Children under

5 years old represent 70.67%.

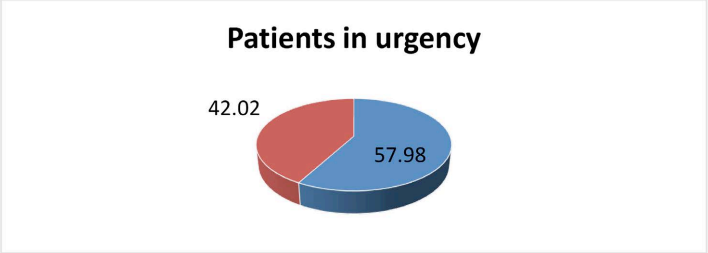

Figure 1. Distribution of patients according to emergency.

3.2.2. Sex of Patients

In our study, there was a male predominance with 121 boys (53.8%) and 104 girls (46.2%). Sex ratio was 1.16.

3.2.3. Patient Residence

In our study, 40.3% of our patients resided in the suburbs.

Patients according to sociodemographic characteristics: Fifty percent point two percent (50.2%) of the patients came from families with an average and low socioeconomic level in 28% and satisfactory in 21.3% (Table 1).

Table 1. Sociodemographic characteristics of patients.

socio-demographic characteristics	n	%
Age of patients		
1 - 59 months	159	70.67%
60 - 191 months	61	27.11%
0 - 28 Days	5	2.22%
Sex of patients		
Male	121	53.8%
Female	104	46.2%
Patient Residence		
Suburb	87	40.3%
City	85	39.4%
Region	43	19.9%
Neighboring country	1	0.5%
Socioeconomic level		
AVERAGE	113	50.2%
Down	64	28.4%
Satisfying	48	21.3%

3.3. Distribution of Patients According to Their Origin

The majority of our patients (64.9%) consulted the HEAR directly without going through a health facility compared to 35.1% who were referred (Table 2).

Table 2. Distribution of patients according to their origin.

Referred	n	%
No	146	64.9
Yes	79	35.1
Total	225	100.0

3.4. Distribution of Patients According to the Reference Structure

Most of our patients: 45.6% were referred by university hospitals (other pediatric services) and 32.9% by the health center (Table 3).

Table 3. Distribution of patients according to the reference structure.

Reference structure	n	%
University Hospital	36	45.6
Health center	26	32.9
Regional hospital	8	10.1
Health post	7	8.9
Others	2	2.5
Total	79	100.0

3.5. Distribution of Patients According to Reason for Referral

The majority of our patients (39.24%) were referred because of the complication of their pathology, 31.65% had a diagnostic or therapeutic problem and 13.5% due to lack of places (Table 4).

Table 4. Distribution of patients according to reason for referral.

	n	%
Complication of pathology	31	41.9
Diagnostic or therapeutic problem	25	33.8
Due to lack of available places	10	13.5
Urgency felt by parents	8	10.8
Total	74	100

3.6. Distribution of Patients According to Time before Consultation

3.6.1. Admission Time

Forty point eight percent (40.8%) of patients were admitted between 2 p.m. and 8 p.m.; 30.6% between 8 a.m. and 2 p.m.; 17.7% between 8 p.m. and 12 a.m. and 10.9% between 12 a.m. and 8 a.m.

3.6.2. Means of Transportation

Only 21.00% of our patients were referred by ambulance compared to 79.00% by public transport (Figure 2).

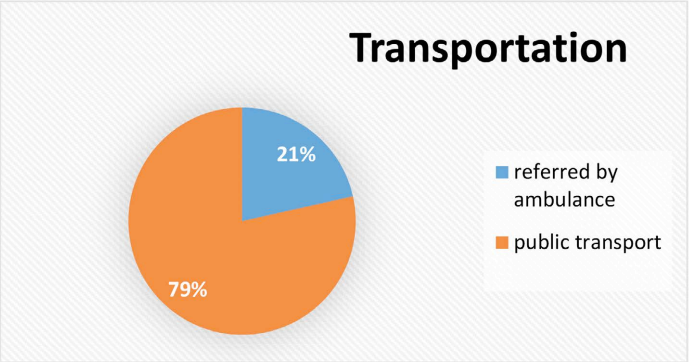

Figure 2. Means of transportation.

3.7. Distribution of Patients According to Type of Transport

Patients according to type of transport (Table 5).

Table 5. Distribution of patients according to type of transport.

Transport type	n	%
Public Transportation	62	78.5
Ambulance	17	21.5
Total	79	100.0

3.7.1. Admission Deadline

A little more than half (42.2%) of the patients consulted within 24 hours following the appearance of symptoms, in 27.8% more than 24 hours and 48 hours and in 20% 48 hours later.

3.7.2. Delivery Time

Nearly 80% of patients were consulted within an hour of their arrival and 55.88% within 30 minutes.

3.8. Distribution of Patients According to Waiting Time before Treatment in the Host Structure

More than half of our patients (55.88%) were treated within 30 minutes of their arrival (Table 6).

Table 6. Distribution of patients according to waiting time before treatment in the host structure.

Delay before support	**n**	**%**
0 to 30 mins	38	55.88
30 mins to 1 hour	16	23.53
1 hour to 2 hours	11	16.18
more than 2 hours	3	4.41
total	68	100.00

3.9. Reasons for Consultation

The main manifestations were dominated by respiratory disorders 26%, neurological 15.11%, hemato-oncological 14.67%, cardiac 14.22%, digestive 12% and infectious 7.11% (Figure 3).

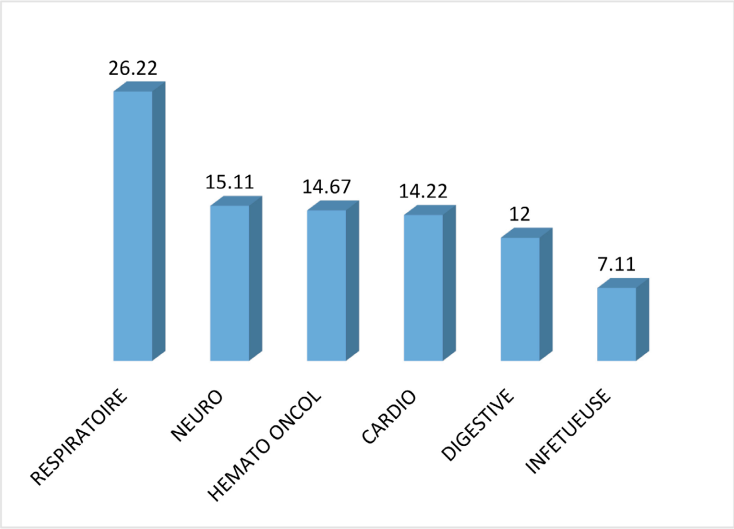

Figure 3. Reasons for consultation.

3.10. Distribution of Patients According to Duration of Follow-Up in the Reference Structure

The duration of follow-up in the structure was dominated by the segment of less than one day: 61.70%, with extremes of 1 and 30 days, *i.e.* on average 2.70 days with a standard deviation of 4.14 (Table 7).

Table 7. Distribution of patients according to duration of follow-up in the reference structure.

Duration followed	n	%
less than a day	37	61.7
1 to 3 days	13	21.7
4 to 7 days	6	10.0
8 to 14 days	3	5.0
15 days and more	1	1.7
Total	60	100.0

3.11. Distribution of Cases According to Management before Referral

More than half, 57.4% of our referred patients had received care before being referred, however, 42.6% of those referred had received nothing before their referral (Table 8).

Table 8. Distribution of cases according to management before referral.

Care before referral	n	%
Yes	35	57.4
No	26	42.6
Total	61	100.0

3.12. Distribution of Patients According to the Type of Care Received before Referral

Half of our patients (50%) had received oxygen before being referred and 14.30% were infused (**Figure 4**).

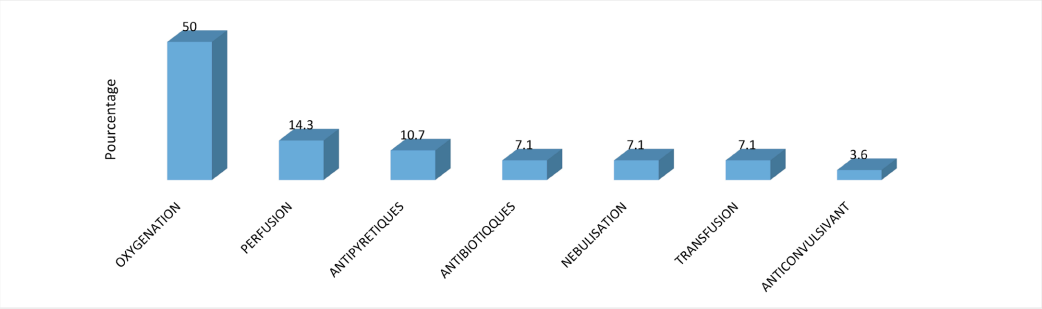

Figure 4. Distribution of patients according to the type of care received before referral.

3.13. Distribution of Patients According to Reasons for Choosing HEAR

Most of the patients (30.5%) were brought directly to HEAR because of supposed better care, 26% because they had felt the urgency, 17.6%: not enough material and technical resources for their support (**Figure 5**).

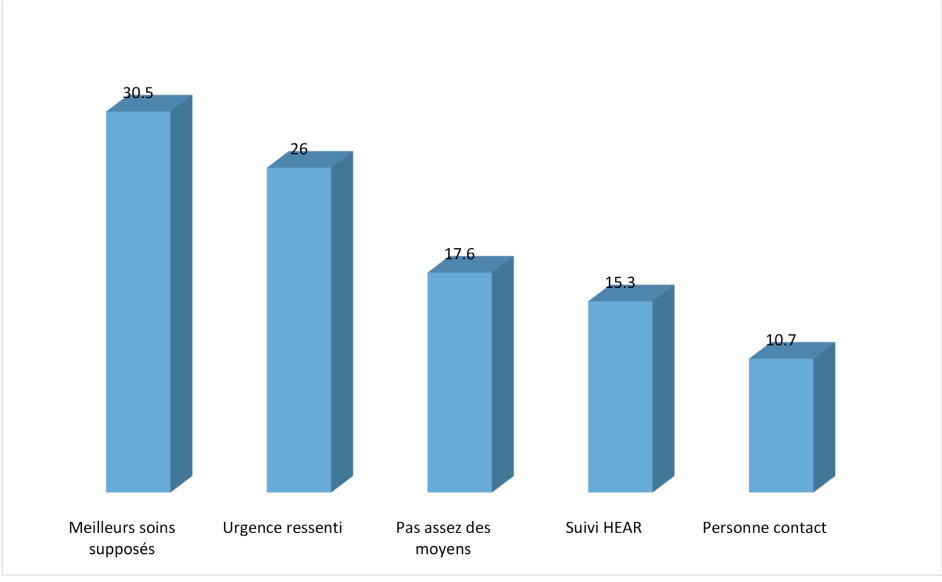

Figure 5. HEAR Distribution of patients according to reasons for choosing HEAR.

3.14. Distribution of Patients According to Diagnosis at Entry

Distribution of patients according to diagnosis (Table 9).

Table 9. Distribution of patients according to diagnosis at entry.

Pathologies	Group details	n	%
Respiratory	Pneumonia	28	26.22
	Asthma	14	
	bronchiolitis	7	
	Pleurisy	2	
	Tuberculosis	4	
	PAH	4	
Neurological	Bacterial meningitis	4	15.11
	Viral meningitis	3	
	Hyperpyretic convulsion	8	
	Metabolic convulsion	2	
	Encephalopathy	2	
	Coma	2	
	TCE	3	
	Epilepsy	10	
Heart disease	non-cyanogenic congenital heart disease	10	14.22
	cyanogenic congenital heart disease	4	
	Rheumatic heart disease decompensated in ICG	7	
	CMD	2	
	Endocarditis	1	
	Thrombophlebitis	8	
Digestives	Acute gastroenteritis	7	12
	Gastritis	6	
	Severe dehydration	5	
	Severe dehydration with shock	4	
	Severe acute malnutrition	5	
Hematological	Vaso-occlusive crisis	10	14.67
	anemia	12	
	others	11	
Infectious	Malaria	3	7.11
	Severe sepsis	5	
	HVA	2	
	Subglottic laryngitis	4	
	Supglottic laryngitis	1	
	Measles	1	

Continued

	Jaundice	2	
Neonatal	INN	2	2.22
	APN	1	

3.15. Distribution of Patients According to Pathologies

The main causes of morbidity were represented by:

Respiratory pathologies 26%, neurological 15.11%, hemato-oncological 14.67%, cardiac 14.22%, digestive 12% and infectious 7.11% (Figure 6).

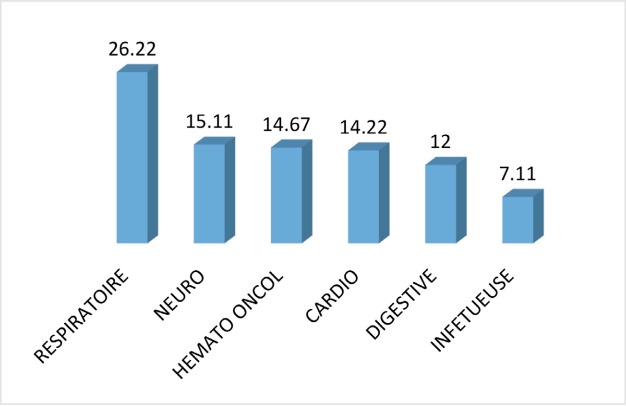

Figure 6. Distribution of patients according to pathologies.

3.16. Distribution of Patients According to Availability of Medications upon Admission to the SAU

Most of our patients (67.1%) had received treatment upon arrival at the HEAR emergency room (Table 10).

Table 10. Distribution of patients according to availability of medications upon admission to the SAU.

Pathology	Workforce	Percentage
YES	151	67.1
NO	74	32.9
Total	225	100.0

3.17. Distribution of Patients According to Treatment Progress

We had recorded 12 deaths, representing a lethality of 5.3% (Table 11).

Table 11. Distribution of patients according to treatment progress.

Evolution	Workforce	Percentage
Execution/Transfer	213	94.7
Death	12	5.3
Total	225	100.0

3.18. Distribution of Patients According to Time of Death

The majority of cases of deaths (66.67%) occurred between 24 and 48 hours, 25% of cases after 48 hours and 8.33% of cases within 24 hours (Table 12).

Table 12. Distribution of patients according to time of death

Time to death	Workforce	Percentage
H 24 - 48	8	66.67
Greater than 48 hours	3	25.00
H0 and H23	1	8.33
Total	12	100

3.19. Distribution of Patients According to Their Discharge Method

Most of our patients (43.11%) had benefited from executives and the others transferred to the different pavilions (Figure 7).

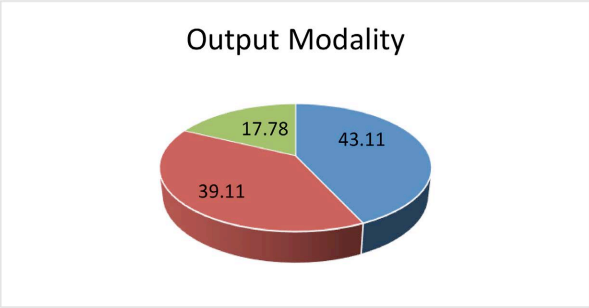

Figure 7. Distribution of patients according to their discharge method.

3.20. The Main Causes of Death

The majority of our patients (33.30%) died due to cardiac pathologies and 25.00% due to severe sepsis (Figure 8).

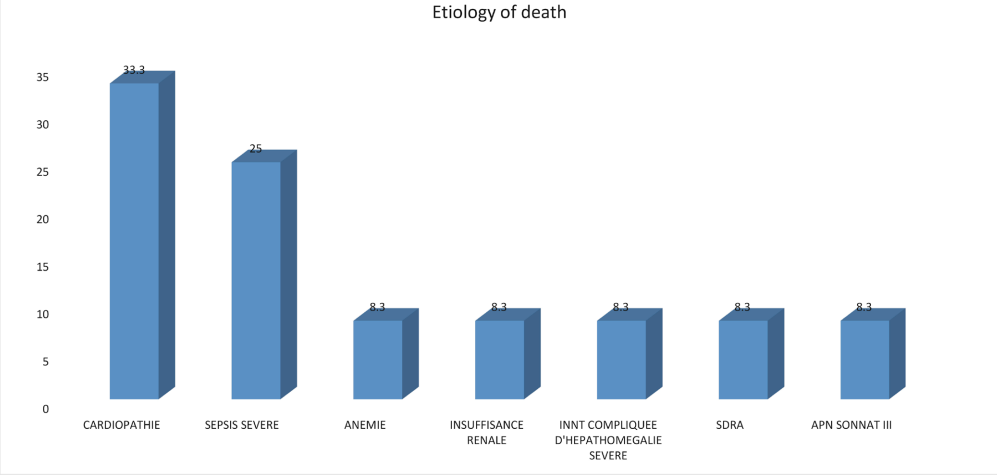

Figure 8. The main causes of death.

3.21. Distribution of Deaths by Sex

Excess male mortality was observed in 83.3% and a statistically significant difference with P = 0.032 (Table 13).

Table 13. Distribution of deaths by sex.

Sex	Evolution			Total	P
	Favorable	Death			
Male	Effective	111	10	121	0.032
	%	52.1%	83.3%	53.8%	
Female	Effective	102	2	104	
	%	47.9%	16.7%	46.2%	
Total	Effective	213	12	225	
	%	100.0%	100.0%	100.0%	

3.22. Distribution of Deaths by Age

The majority of our deceased patients (91.70%) were in the age group of 1 to 59 months, a statistically significant difference with P = 0.011 (Table 14).

Table 14. Distribution of deaths by age.

Age	Evolution			Total	P
	Favorable	Death			
0 - 28 days 1 - 59 months	Effective	2	1	3	0.011
	%	0.9%	8.3%	31.3%	
AVERAGE 60 - 180 months	Effective	148	11	159	
	%	69.5%	91.7%	70.7%	
Pupil Total	Effective	63	0	63	
	%	29.6%	.0%	28.0%	
Total	Effective	213	12	225	
	%	100.0%	100.0%	100.0%	

3.23. Study of Death According to Availability of Medication on Admission to the SAU HEAR

More than half of the deceased patients (67%) had not received adequate treatment on admission but the difference is not statistically significant P = 0.06 (Table 15).

Table 15. Availability of emergency medications.

Availability of emergency medications	Evolution			Total	P
	Favorable	Death			
YES	Effective	146	5	151	0.06
	%	68.5%	41.7%	67.1%	

Continued

NO	Effective	67	7	74
	%	31.5%	58.3%	32.9%
Total	Effective	213	12	225
	%	100.0%	100.0%	100.0%

3.24. Distribution of Deaths According to the Socio-Economic Level of Families

The difference was statistically significant P = 0.000 (Table 16).

Table 16. Distribution of deaths according to the socio-economic level of families.

Socio-economic level		Evolution		Total	P
		Favorable	Death after admission		
Down	Effective	53	10	63	0.229
	%	24.9%	83.3%	28.0%	
AVERAGE	Effective	109	2	111	
	%	51.2%	16.7%	49.3%	
Pupil	Effective	51	0	51	
	%	23.9%	.0%	22.7%	
Total	Effective	213	12	225	
	%	100.0%	100.0%	100.0%	

3.25. Distribution of Deaths According to the Type of Transport Used

More than half of the deceased patients (62.5%) had used public transport but the difference was not statistically significant P = 0.229 (Table 17).

Table 17. Distribution of deaths according to the type of transport used.

In case of vital risk according to the reference, specify the transport used		Evolution		Total	P
		Favorable	Death after admission		
Ambulance	Effective	14	3	17	0.229
	%	19.7%	37.5%	21.5%	
Public transportation	Effective	57	5	62	
	%	80.3%	62.5%	78.5%	
Total	Effective	71	8	79	
	%	100.0%	100.0%	100.0%	

3.26. Distribution of Deaths According to Care before Transfer

The vast majority of our patients (85.7%) who died had received treatment before

their transfer compared to 14.3% who had received nothing. The difference was not statistically significant P = 0.112 (Table 18).

Table 18. Distribution of deaths according to care before transfer.

In case of vital risk, did the patient receive care before transfer?	Evolution			Total	P
	Favorable	Death after admission			
Yes	Effective	29	6	35	0.112
	%	53.7%	85.7%	57.4%	
No	Effective	25	1	26	
	%	46.3%	14.3%	42.6%	
Total	Effective	54	7	61	
	%	100.0%	100.0%	100.0%	

3.27. Distribution of Deaths According to Mode of Transfer

Most of our deceased patients (66.7%) were referred by health structures compared to 33.3% of deceased who consulted themselves. The difference is statistically significant with P = 0.023 (Table 19).

Table 19. Distribution of deaths according to mode of transfer.

Specify whether the patient is referred or if he consults on his own	Evolution			Total	P
	Favorable	Death after admission			
Refers	Effective	71	8	79	0.023
	%	33.3%	66.7%	35.1%	
Consult himself	Effective	142	4	146	
	%	66.7%	33.3%	64.9%	
Total	Effective	213	12	225	
	%	100.0%	100.0%	100.0%	

4. Discussion

4.1. Study Limitations

Other parents not being available, difficulty in having all the information.

Other patients did not have reference letters and sometimes they were incomplete.

Contacting reference structures by telephone is sometimes difficult given the quality of the prospective study.

4.2. Ethical Considerations

Individual verbal informed consent was sought and obtained from the patient's parents or companions before any inclusion.

Prior authorization by the head of department has been obtained.

4.3. Morbidity

The general consultation during our study for all HEAR was 20,062 patients. Among the 10,598 patients seen at the outpatient clinic of the HEAR Emergency Reception and Management Service, 388 patients were hospitalized, representing a hospitalization rate of 3.66%. This situation suggests that the service is very often overrun by patients presenting mainly benign pathologies relating to peripheral structures.

However, it appears from several studies that the unnecessary increase in workload is likely to alter the quality of care for patients requiring urgent and specialized care according to WHO [11].

However, despite the low hospitalization rate (3.66%), we noted that more than half of the patients hospitalized during the period of our study were in an emergency situation (57.98%) of 388 patients, a rate similar to that found by SYLLA *et al.* [9] and LY Fatou [10] *et al.*, all from Dakar, had found respectively 57% (563 patients/995 hospitalized) and 57.2% (209 patients/365 hospitalized) and DAN V. 2818 patients/184 hospitalized, *i.e.* 60% in Cotonou. This seems normal to us given that our service is a structure of last resort for referrals.

4.4. Sociodemographic Characteristics

Age: The age of our patients is between 0 and 15 years (minimum 0.23 months, maximum 191 months, average 47 months and standard deviation 54). Children under 5 years old represent 70.67%. This predominance of children under 5 years old is found by several authors: COULIBALY B. 82.4%, AZOUMAH DK 69.3% [13] and SYLLA *et al.* 74% [9]. This phenomenon is naturally explained by the vulnerability of children at this age, and their sensitivity to infections (DEMBELE A) [14].

Sex: The male gender was in the majority with 53.8%, an overall sex ratio equal to 1.16. This predominance had been noted in several previous studies: SOUNTOURA IA boys 53.5% [15] versus girls 46.5%, sex ratio of 1.15 and AIBO. IN [14] boys 56% and girls 44%, sex ratio of 1.28.

However, none of the studies were able to establish a formal link between sex and the scientifically valid reference.

Origin and residence [6] [15]: The majority of our patients came directly from home, that is to say, they consulted themselves, *i.e.* 64.9% compared to 35.1% of referred children. Our results are similar to those of COULIBALY B. (57.9%) and ABDOU R. O *et al.* (77.8%). This result is discouraging and demonstrates the population's non-compliance with the health pyramid but also the absence of criteria for admission to the service although the overall frequency of referrals is low (35.1% of hospitalized patients). It can be improved through behavior change communication. The majority of these patients who consulted themselves, *i.e.* 30%, justified their consultation by supposed better care, 26% by perceived urgency, 17.6% by peripheral failure and 15.3% had already been followed at least once before. HEAR. The majority of our patients came from the suburbs of Dakar

and the city of Dakar: 80% of patients resided in Dakar compared to 18.6% outside. This result is close to those of COULIBALY S. (86%) [16] S.Y. O (90%) [17] and higher than that of AIBO IN (60.4%) [16], Contrary to popular belief, emergency cases increase with the distance that separates the patient's home from the hospital. They come late when the child's condition worsens. This could be explained by non-compliance with the health pyramid. Among those referred, 40.51% of our patients were referred by other pediatric services compared to 32% of health centers. The reasons for referral are: complications of their pathology 41%, and insufficient diagnosis 33.80%. This is also explained by the insufficient reception capacity in these structures and technical facilities which still remain incomplete.

Socioeconomic level of parents during our study, 49.5% of the parents of our hospitalized patients had a socio-economic level considered average. This result is similar to that of SIDIBE M. who found 45.6% in Mali [18] and LY Fatou [10] 53% patients in Senegal from families with an average socio-economic level. Contrary to what DAN V [19] had found, 99% of emergencies came from our patients who came for consultation in the first three days of progression of the disease represented 42.65%. Also to consult a hospital such as Albert Royer which is a national reference structure it also requires having a little means where the majority of patients are Dakar residents with a slightly improved standard of living than 5 years ago.

4.5. History of the Disease

Our patients who came for consultation in the first three days of disease progression represented 42.65%. The average time taken by our patients before the consultation was 2.7 days. This study shows that the normal time and the maximum time were 1 day and 2 years respectively. Our result could be explained by its easy accessibility and by the better care assumed by those accompanying it. Ly Fatou in 2002 found around 50% of patients who had been consulted early within 24 hours. DIOUF *et al.* in Senegal [20]: in their series none of the patients had been consulted within 24 hours following the start of the symptoms and 66.5% of cases of pathologies had been evolving for 7 days. ABDOUL *et al.* in Gabon [15]: for whom 67.5% of children were brought for consultation 24 hours after the start of the symptoms. In Africa in general, delays in seeking hospital treatment are often reported. The remoteness and/or isolation of certain geographical areas that are difficult to access, transport difficulties, certain beliefs and the recourse first to traditional practitioners, partly justify the delay in consultation compared to developed countries.

4.5.1. Delivery Time in the Host Structure

The majority of our patients: 84.41% were treated within one hour of their arrival at the SAU. This result is similar to that of LY Fatou *et al.* [10]. This could be explained by a good organization of emergency care noted since the construction of the new buildings, the presence of TRI service, and red boxes nearby. The shorter the

treatment time, the better the quality of patient care, as in the case of our study.

4.5.2. Support before Referral and Type of Transport

In our series, 57.4% of our referred patients had received care before being referred, however, 42.6% of the referred patients received nothing before their transfer. We found that 21.50% of patients were referred by ambulance compared to 78.50% by public transport. On the other hand, in Benin AKODJENOU J [21] *et al.* had found the motorcycle taxi (commonly called Zémidjan in Benin), as the most used means of transport in their study in 71.72% of cases followed by 24.18% by personal vehicle. 96% of referred children did not have medical assistance during their transfer. Only 1.63% were transferred by ambulance. These results are low compared to those of SIDIKI B. GUINDO in Burkina-Faso [22] which found 69.3% of patients transferred by ambulance and 19.80% benefiting from medical assistance during their transfer. This is explained by the patient transport system, set up in Bobo-Dioulasso (Burkina-Faso), from peripheral maternity wards to the hospital, and which works thanks to Burkina relief and/or the firefighters who crisscross the area. City 24 hours a day, a system that does not exist in Abomey-Calavi/Sô-Ava (AKODJENOU and GREGOIRE) [21]. Furthermore, these data are more or less similar to those of SYLLA [9] (28%) and GUEYE (36%). On the other hand, in developed countries, the ambulance is used in 80 to 92% of emergency cases, and in 50% to 60% of these cases are medically justified (LY Fatou). This low rate of ambulance use could be explained by the origin of emergency consultants who in 64.9% came from home.

4.5.3. Delays before the Transfer Decision Is Made by the Reference Structure

The time taken to make the decision to transfer a patient was more than one hour in 61.70% of cases. Much higher than that of NDIAYE O. *et al.*: 35.90% [8]. Our result can be explained by the fact that most of our patients were referred by other pediatric structures which, after treatment, refer the patients due to insufficient technical facilities. The sooner the patient is referred, the more likely he or she will recover quickly in the reception structure.

4.6. Main Causes of Morbidity [20]

In our series, the main causes of morbidity were respiratory pathologies (26%), followed by neurological (15.11%), hematological (14.67%), cardiac (14.22%), digestive (12%) and infectious. (7.11%) and others. Respiratory conditions occupy first place with 26.22%, and our result is similar to that of Coulibaly A. and the same constant was made by CAMARA B. DIOUF *et al.* Who had noticed that the Respiratory pathologies are dominated by bronchiolitis and asthma attacks which are usually most frequent during the hot and humid season of the year which corresponds to the period of our study. Children who are often away from home due to heat and crowding are more exposed to pneumallergens. For Dr Sanou Dieng Mbaye, "Senegal records 27,000 child deaths per year, including 73 deaths per day.

Most deaths are preventable and 12% of deaths are due to pneumonia. Neurological conditions:15.11% occupy second place, contrary to what others found that digestive conditions occupied second place. ATANDA HL *et al.* [4] found neurological emergencies in the lead with 52%, followed by respiratory emergencies 21.5% then hematological 12.7% and gastroenteritis 11.5% of cases in black point 1994. Hematological conditions: 14.67%, dominated by conditions linked to sickle cell anemia and anemia. Heart diseases occupy 4th place, marked by decompensated non-cyanogenic congenital heart diseases, anoxic discomfort and rheumatic heart disease. Infectious causes: 7.11%, dominated by malaria and severe sepsis.

4.6.1. Mortality

Among the 225 hospitalized patients, we recorded 12 deaths. The mortality rate was 5.30%. This mortality rate is lower than that of NDIAYE O. *et al.* in 2002 in HEAR had found a fatality rate of 26.1% and COULIBALY B. [11] in 2006 on 381 hospitalized; 74 deaths or a mortality rate of 19.4% - this rate is similar to that of OUNOGO MS (417 hospitalized patients, 19 cases of deaths or 4.55%) [23]. The HEAR improves the quality of care on a daily basis in order to meet the objectives of the WHO and SDG (3.2 by 2030). But this rate remains even higher than that of GHORBAL FS in Tunis, 2.4% [24].

4.6.2. Sociodemographic Characteristics

1) Sex The proportion of boys who died (83.3%) was higher than that of girls (16.7%). Confirming the excess male mortality reported by several authors: AIBO and SYLLA *et al.* without a scientifically valid reason. This difference observed in mortality based on sex was significant with P = 0.032.

2) Age We noted high mortality among children aged 1 to 59 months with a mortality rate of 91.7%, newborn 8.3%, and no deaths beyond 59 months were recorded. This high excess mortality in this class age could be explained by their vulnerability to complications of infectious and nutritional pathologies. And no death beyond 59 months. This confirms the WHO report which shows significant progress in improving care for this age group due to the reduction in infectious diseases.

4.6.3. Availability of Medications at the SAU

Half of our deceased patients (58.3%) had not received the medications adapted to their emergency upon admission to the SAU compared to (42.7%). However the difference was not statistically significant P = 0.06. Our results could be explained by the fact that the hospital pharmacy does not have all kinds of essential resuscitation drugs and sometimes experiences stock shortages. The other fact is that the HEAR does not have permanent blood stocks, ward boys must go to the National Blood Transfusion Center (CNTS) to obtain blood. Our results are different from those of COULIBALY B. (18.85%) [5].

4.6.4. Socio-Economic Level

The majority of our deceased patients came from families with a low socio-

economic level (83.3%), medium (16.7%) and no cases of death observed in families with a high socio-economic level. The difference was statistically significant P = 0.000. GHORBAL in Tunis reported that the mortality rate among children experiences an evolution proportionally inverse to the socio-economic level. Low socio-economic level among parents and residence in a rural area are the main risk factors for pediatric mortality throughout the world according to several authors (Fengming Chao *et al.*).

4.6.5. Length of Hospitalization

The majority of our patients died between 24 hours and 48 hours followed by 25% after 48 hours and 8.33% before 24 hours. This excess mortality before between 24 and 48 hours could be explained by the delay in transfer or delay in the detection of signs of seriousness by the patients' parents and diagnostic problems on admission. The result is contrary to that of DIACK, in 2017 in Dakar which showed that many deaths occurred between 3 and 7 days (52.1%); KOUETA *et al.* [25] duration of 1.6 days and GHORBAR a longer duration of 6 days [24].

4.6.6. Main Causes of Death

The majority of our patients died following cardiac pathologies 33.30%, followed by septic shock 25.00%.

The cost of cardiovascular surgery makes better care impossible, leading to complications and death. Recommendation for finding partners to cover intervention costs.

5. Conclusions

The majority of our patients died following cardiac pathologies 33.30%, followed by severe sepsis 25.00%.

There is a reduction in deaths linked to respiratory pathologies following vaccination according to WHO. The cost of cardiovascular surgery makes better care impossible, leading to complications and death. The cost of cardio-vascular surgery makes better care impossible, leading to complications and death.

Pediatric emergencies are frequent and responsible for lethality, but the construction of a new emergency department has made it possible to reduce lethality,

Much effort remains essential to achieve the standards.

Recommendations:

To health and political authorities:

Establish an effective emergency reception and resuscitation service in other services that lack it and make them functional.

Provide continuing training for medical and paramedical staff.

Organize the conditions of transfer and counter-transfer by creating a SAMU specialized for children.

To the nursing staff:

Ongoing training is necessary to maintain and consolidate skills; we must take advantage of it.

Faced with the lack of improvement in the condition of a child in the periphery; make a referral to a higher level as soon as possible and preferably by medical transfer.

Ensure patient follow-ups and rigorous monitoring.

To the Population:

To respect the health pyramid in terms of recourse to care.

In case of emergency, consult spontaneously without choosing the consultation time.

Q1. Initial of first names

Q2. Name initial

Q3. Suburb Address or geographic origin: city, center or regions others

Q4. ADMISSION DATE

Q5. RELEASE DATE

Q6. AGE : / / month or / / years

Q7. SEX:

Q8. Number of children:

Socio-Economic Level

Q9. Father or mother (living = 1 deceased = 2)

Q10. If living father or mother

Q11. He is an employee/Worker: yes = 1, no = 2; Civil servant: yes = 1, no = 2

Others:

Q12. Does the father own the house?→(yes = 1; no = 2)

Q13. Do you have a car?→(yes = 1; no = 2)

Q14. Do you have a telephone?→(yes = 1; no = 2)

Q15. Do you have running water?

Q16. Do you have electricity

- Reference/Self-Reference

Q17. Specify whether the patient is referred or if he consults himself (1 = referred; 2 = self-consultant)

Q18. Time before consultation since the onset of symptoms…

- The Sick is Referred

Q19. Specify the type of service that refers to:

(1 = health post; 2 = health center; EPS, 3 = social pediatric institute (IPS), 4 = pediatric surgery; 5 = other pediatric services outside of Albert Royer)

Q20. Duration of follow-up in the referring department in days before referral

Q21. Reasons for reference

(1 = vital risk; 2 = diagnostic or therapeutic problem; 3 = urgency felt by parents; 4 = others, specify…; 5 = reasons for referral not specified)

Q22. In case of vital risk according to reference specify the type of transport

(1 = medicalized (ambulance); 2 = non-medicalized (public transport; 3 = private transport)

Q23. In case of vital risk, did the patient receive care before transfer?

(Yes = 1; no = 2)

Q24. If yes, specify: .....……

The Sick Consults Himself

Q25. What are the reasons for choosing the A. Royer Hospital: ……

(1 = felt urgency; 2 = failure in the periphery; 3 = contact person; 4 = best care assumed; 5 = others)

Q26. Delay before support

- On Admission to the Hospital

IV. 1 Opinion of the sorting nurse:

(1 = true emergency; 2 = non-urgent)

Availability of emergency medications: (yes = 1; no = 2)

IV. 2 Diagnosis

Diagnosis on arrival:……

- Exit diagnosis: ……..

Others specify: …… ……..

III. Evolution

1 = death after admission; death on arrival:

If death: time of death: 24 hours…, 24 - 48 hours…, sup. at 48 hours

2 = Favorable.....

3 = Internal transfer…….....

4 = External.....

Conflicts of Interest

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

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