

# Pattern and Outcome of Diseases among Children Presenting in the Emergency Room of a Tertiary Hospital in Port Harcourt, Nigeria

Uchenna C. Onubogu\*, Boma A. West

Department of Paediatrics & Child Health, Rivers State University/Rivers State University Teaching Hospital, Port Harcourt, Nigeria

Email: \*uchenna.onubogu@pan-ng.com, \*utchayonubogu@yahoo.co.uk, westboma@yahoo.com

**How to cite this paper:** Onubogu, U.C. and West, B.A. (2022) Pattern and Outcome of Diseases among Children Presenting in the Emergency Room of a Tertiary Hospital in Port Harcourt, Nigeria. *Open Journal of Pediatrics*, 12, 538-553.

<https://doi.org/10.4236/ojped.2022.123057>

**Received:** June 13, 2022

**Accepted:** July 11, 2022

**Published:** July 14, 2022

Copyright © 2022 by author(s) and Scientific Research Publishing Inc. This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

## Abstract

**Background:** Children's emergency care is a critical aspect of Paediatric health care. Evaluation of the emergency room would audit the quality of care provided and give insight into the epidemiology of the diseases that cause morbidity and mortality. **Aim:** To determine the pattern and outcome of diseases seen in the children's emergency room. **Methodology:** This was a retrospective review of the children's emergency room register of the Rivers State University Teaching Hospital, Port Harcourt Nigeria from Jan 2015 to May 2017. **Results:** A total of 1965 patients were evaluated, and there were more males 1082 (55.1%) with an M: F ratio of 1.3 :1, their ages ranged from one day old to 16 years old with 57.1% (1131) aged < 2 years old. The five common indications for emergency room visits were all infectious diseases and they included malaria 360 (18.3%), sepsis 234 (11.9%), gastroenteritis 204 (10.4%), upper respiratory tract infections 173 (8.8%), and bronchopneumonia 155 (7.9%). The common non-infectious indications were trauma 115 (5.9%), acute asthma 103 (5.2%), and sickle cell disease 81 (4.1%). Among the children who visited the emergency room for a consult, 886 (45.1%) were not admitted, 893 (45.5%) of them were discharged, mortality was recorded in 62 (3.2%) and 81 (4.1%) left the hospital against medical advice. **Conclusion:** Children within the first 5 years of life constituted the highest number of patients seen in the children's emergency room with male predominance. Infectious diseases accounted for more than two-thirds of the cases.

## Keywords

Emergency, Children, Malaria, Sepsis, Gastroenteritis, Pneumonia, Nigeria

## 1. Introduction

The Children Emergency Room (CHER) caters to children with acute illnesses or injuries that require urgent attention. It is thus a critical aspect of paediatric health care as urgent decisions and prompt actions taken may forestall mortality and reduce morbidity.

Paediatric emergency rooms are well developed in terms of manpower and infrastructure in developed countries unlike in middle- and low-income countries [1]. In developed countries, paediatric emergency rooms are manned by specialists in paediatric emergencies. This is however not the case in the middle- and low-income countries where these units are overseen majorly by general paediatricians who may lack expertise in paediatric emergency medicine and as such may have poorer outcomes. In addition, this situation may even be worse in Nigeria where the ratio of paediatricians to children is low [2] [3] [4].

The pattern of disease seen in the Children's Emergency Room (CHER) differs from those in the adult emergency room. Several studies in Nigeria [5]-[10] and other African countries [11] [12] have documented preventable diseases such as malaria, pneumonia, gastroenteritis, etc as the commonest indications for paediatric Emergency room visits as well as the commonest causes of death. It is, however, important to note that non-communicable and hereditary diseases are now on the increase such as sickle cell anaemia, diabetes mellitus, and hypertension [2] [13] [14] [15].

Mortality rates in the emergency room vary from place to place ranging from 2.5% - 11.6% [5]-[10] [16] with the majority occurring within 24 hours of admission [10] [15] [17] [18].

Children at presentation in the emergency room are typically triaged, resuscitated, and either transferred to the paediatric ward for further management or discharged home to be followed up in the paediatric outpatient clinic.

The present study was therefore carried out to determine the pattern and outcome of children presenting in the emergency room in Rivers State University Teaching Hospital as no study of this kind has been done in our facility. This study is pertinent as periodic evaluation of the emergency room would audit the quality of care provided in terms of its infrastructure and technical know-how and would also give insight into the epidemiology of the diseases that cause morbidity in our locality, which would also influence the health care training needs of not just our hospital but the referring primary health care centers and the larger community.

## 2. Method

This was a retrospective review of the Children Emergency ward register of the Rivers State University Teaching Hospital, Port Harcourt Nigeria (RSUTH), over 29 months, from Jan 2015 to May 2017. The hospital is a tertiary hospital located in the south, south part of Nigeria and it receives referrals from peripheral hospitals within the state and neighbouring states. The children's emer-

gency ward is a 12 bedded ward that is open for 24 hours. Patients seen in the emergency ward can be discharged immediately after consult or admitted based on the severity of their cases. Those admitted into the emergency ward may be transferred to the Children's medical ward within 48 hours after they have been stabilized or retained in the emergency ward if their clinical condition was still critical and thus requires closer monitoring while those who have been stabilized within 24 hours may also be discharged from the emergency ward. Data of all children seen in the emergency during the study period as recorded in the register were consecutively recruited. The information retrieved from the register included age, gender, weight, diagnosis, and outcome. Patients whose guardians officially signed papers to be discharged against medical advice and patients that absconded from the ward without due authorization were classified as those that left against medical advice (LAMA). The age of the children was classified using standard paediatric age group classification into Neonates (Aged  $\leq 1$  month), Toddlers (aged  $> 1$  month to  $< 2$  years), Preschool age (2 years to  $< 6$  years), Primary School age (6 to 12 yrs), and Adolescent ( $> 12$  yrs) [19] [20].

Diseases that occurred once were classified as others while patients whose diagnoses were not recorded in the admission register were classified as undocumented diagnoses. Data were entered into an excel spreadsheet and analysed using IBM SPSS statistics version 23.

Univariate descriptive statistics were used to explain the characteristics of the study population with measures of central tendency and dispersion. A test for normality was done for numerical variables using Shapiro-Wilk and Kolmogorov-Smirnov test. Data distribution was expressed in tables, graphs, charts, and frequencies were also in percentages.

### 3. Results

#### **Characteristics of the study population and Emergency consult description**

A total of 1965 patients were evaluated. There were more males 1082 (55.1%) with M: F ratio of 1.3:1, their ages ranged from one day old to 16 years old. The median age was 1 year, and the majority of the children 1287 (65.5%) were less than 2 years old. Among 983 (50.1%) who had their weight documented, the median weight for age Z score was  $-0.014$ , a majority had normal weight for age 682 (69.4) while 167 (17.0%) were underweight. Infectious diseases 1400 (71.2%) were the commonest pathology seen. The majority of 893 (45.5) were discharged out of CHER either to go home or for continued care on the ward after stabilization had been achieved in CHER while 886 (45.1%) of the patients who visited the Emergency room for a consult were not admitted. Mortality was recorded in 62 (3.2%) and 81 (4.1%) left the hospital against medical advice (Table 1).

#### **The pattern of diseases seen in the CHER by age distribution**

The Six common indications for Emergency room visits were all infectious diseases and they included Malaria 360 (18.3), Sepsis 234 (11.9%), Gastroenteritis

**Table 1.** Characteristics of the study population and emergency consult description.

Variables	Frequency N = 1965 n (%)
<b><i>Age (years)</i></b>	
<1 month	87 (4.4)
>1 month to <2 yrs	1131 (57.6)
2 to <6 yrs	254 (12.9)
6 to 12 yrs	313 (15.9)
>12 yrs	74 (3.8)
Age unrecorded	106 (5.4)
<b><i>Gender</i></b>	
Male	1082 (55.1)
Female	852 (43.4)
Unrecorded	31 (1.6)
<b><i>Weight for age z score n = 983</i></b>	
>2 (Overweight)	134 (13.6)
2 to -2 (Normal weight)	682 (69.4)
<-2 (Underweight)	167 (17.0)
Weight undocumented	982
<b><i>Disease type</i></b>	
Infectious/communicable disease	1400 (71.2)
Non-communicable diseases	530 (27)
No disease documented	35 (1.8)
<b><i>Outcome</i></b>	
Not admitted after consult	886 (45.1)
Discharged Home	567 (28.9)
Transferred to the ward	326 (16.6)
LAMA	81 (4.1)
Referred	43 (2.2)
Died	62 (3.2)

204 (10.4%), Upper respiratory tract infections 173 (8.8%), Bronchopneumonia 155 (7.9%), and Meningitis 133 (6.8%) in descending order of frequency. These diseases were also the predominant diagnosis in children < 6 years of age. The common non-infectious indications for Emergency room visits were trauma 115 (5.9%), Acute asthma 103 (5.2%), and Sickle cell disease 81 (4.1%).

Among neonates, the most common disease seen in emergency room consults was, Sepsis 17 (19.5%) followed equally by Asphyxia 16 (18.4%) and Prematurity

16 (18.4%), while in children aged 6 to 12 years, the most common indications for Emergency room visit was trauma 51 (16.3%), followed by Malaria 45 (14.5%), Acute asthma 40 (12.18%) and Meningitis 35 (11.2%), The same age group also accounted for the highest number of trauma cases seen 51 (44.3%) and the highest number of acute asthma cases seen 40 (38.8%).

In children aged > 12 years, the commonest reason for an emergency consult was malaria 11 (14.9%), followed by acute asthma 10 (13.5%), sickle cell disease 10 (13.5%) in equal proportions, and subsequently by Meningitis 9 (12.5%) (**Table 2**).

#### **Common monthly disease patterns in CHER**

Diseases seen in the year 2015 and 2016 only were analysed for seasonal frequency of disease patterns with a total of 1741 cases while 224 diseases seen in the year 2017 were excluded as they covered only the months of January to May when the study ended. The 6 common diseases seen in the children's Emergency room (CHER) had varying frequencies throughout the year with periods of high peaks and lows.

**Malaria:** The monthly case incidence ranged from 16 - 34 cases per month. The monthly incidence was consistently higher than other cases throughout the year. There was a stepwise increase in peaks in February, May, and August. The 3<sup>rd</sup> quarter (October-December) started with a gradual but steady rise which plateaued till the end of the year.

**Sepsis:** Monthly cases of sepsis ranged from 9 to 22 cases per month. Monthly cases of sepsis gradually increased from January to peak in March before a steady decline with the lowest monthly cases seen in June after which there were two more peaks in August and November, with the latter higher than the former.

**Gastroenteritis:** Monthly cases of gastroenteritis ranged from 6 to 28 cases per month with a monthly average of 16 cases per month. The highest incidence was seen in February followed by, followed by a steady decline, the lowest monthly case was seen in June before rising to achieve a second much lower peak in November.

**URTI and Bronchopneumonia:** Both Followed similar patterns with a different average monthly incidence of 16 and 13 for bronchopneumonia and URTI infection respectively. Their Highest incidence is seen in March after which there is a gradual decline till June when the lowest incidence of URTI is recorded, although the number of monthly cases of bronchopneumonia also declines through June it does not go as low as URTI, the two diseases, however, have a second smaller peak in July and August before they both gradually decline in December and January.

**Meningitis:** Monthly cases of Meningitis, ranged from 3 to 20 cases per month. The number of cases per month demonstrated a swinging pattern with highs and lows alternating with each preceding month. The highest cases were seen in November followed by April while the lowest case was seen in January (**Figure 1**).

**Table 2.** Pattern of disease seen in CHER by age distribution.

Major diagnosis	<1 mth	>1 mth to 2 yrs	2 to <6 yrs	6 to <12 yrs	>12 yrs	No age	Total n (%) ↓
Malaria	0 (0)	216 (60)	72 (20)	45 (12.5)	11 (3.1)	16 (4.4)	360 (18.3)
Sepsis	17 (7.3)	176 (75.2)	17 (7.3)	9 (3.8)	1 (0.4)	14 (6)	234 (11.9)
Gastroenteritis	0 (0)	154 (75.2)	21 (10.2)	14 (6.8)	7 (3.4)	8 (3.9)	204 (10.4)
URTI	1 (0.6)	126 (72.8)	24 (13.8)	14 (8.1)	1 (0.6)	7 (4.0)	173 (8.8)
Bronchopneumonia	2 (1.3)	126 (81.3)	6 (3.9)	7 (4.5)	3 (1.9)	11 (7.1)	155 (7.9)
Meningitis	0 (0)	64 (48.1)	18 (13.5)	35 (26.3)	9 (6.8)	7 (5.3)	133 (6.8)
Trauma*	0 (0)	30 (26.1)	19 (16.5)	51 (44.3)	7 (6.1)	8 (7.0)	115 (5.9)
Acute asthma*	0 (0)	24 (23.3)	20 (19.4)	40 (38.8)	10 (9.7)	9 (8.7)	103 (5.2)
SCDx*	0 (0)	18 (22.2)	16 (19.8)	28 (34.6)	10 (12.3)	9 (11.1)	81 (4.1)
Others	4 (9.8)	20 (48.8)	1 (2.4)	12 (29.3)	0 (0)	4 (9.8)	41 (2.1)
Undocumented diagnosis	2 (5.7)	20 (57.1)	4 (11.4)	6 (17.0)	2 (5.7)	1 (2.9)	35 (1.8)
HIV	0 (0)	22 (62.9)	6 (17.1)	6 (17.1)	1 (2.9)	0 (0)	35 (1.8)
Acute Abdomen*	0 (0)	17 (51.5)	5 (15.2)	8 (24.2)	2 (6.1)	1 (3.0)	33 (1.7)
Bronchiolitis	0 (0)	27 (96.4)	0 (0)	0 (0)	1 (3.6)	0 (0)	28 (1.4)
Cellulitis and dermatitis	0 (0)	16 (61.5)	4 (15.4)	5 (19.2)	0 (0)	1 (3.8)	26 (1.3)
NNJaundice*	21 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	21 (1.1)
Healthy	1 (5.3)	15 (78.9)	3 (15.8)	0 (0)	0 (0)	0 (0)	19 (1)
Asphyxia NN*	16 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	16 (0.8)
Prematurity*	16 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	16 (0.8)
poisoning and foreign body*	0 (0)	7 (46.7)	3 (20.0)	3 (20.0)	0 (0)	2 (13.0)	15 (0.8)
Cardiac Pathology*	0 (0)	13 (92.5)	0 (0)	1 (7.1)	0 (0)	0 (0)	14 (0.7)
Renal pathology (ARF/AGN)*	0 (0)	8 (57.1)	5 (35.7)	1 (7.1)	0 (0)	0 (0)	14 (0.7)
Inguinoscrotal pathologies*	0 (0)	9 (69.2)	0 (0)	1 (7.7)	2 (15.4)	1 (7.7)	13 (0.7)
Tuberculosis	0 (0)	7 (63.6)	0 (0)	2 (18.2)	1 (9.1)	1 (9.1)	11 (0.6)
Conjunctivitis and Periorbital cellulitis	0 (0)	5 (50)	1 (10)	3 (30)	0 (0)	1 (10)	10 (0.5)
Sexual assault*	0 (0)	0 (0)	1 (10.0)	8 (80.0)	1 (10.0)	0 (0)	10 (0.5)
Cancers*	0 (0)	2 (25.0)	3 (37.5)	2 (25.0)	0 (0)	1 (12.5)	8 (0.4)
Non cardiac congenital malformation*	5 (71.4)	0 (0)	1 (14.3)	0 (0)	0 (0)	1 (14.3)	7 (0.4)
UTI	0 (0)	2 (28.6)	1 (14.3)	1 (14.3)	3 (42.9)	0 (0)	7 (0.4)
Measles /Varicella	0 (0)	4 (80)	0 (0)	1 (20)	0 (0)	0 (0)	5 (0.3)
Otitis media	0 (0)	3 (60)	0 (0)	2 (40)	0 (0)	0 (0)	5 (0.3)
Anaphylaxis /Urticaria*	0 (0)	0 (0)	0 (0)	4 (100)	0 (0)	0 (0)	4 (0.2)
Typhoid	0 (0)	0 (0)	1 (25)	0 (0)	2 (50.0)	1 (25.0)	4 (0.2)

Continued

Osteomyelitis	0 (0)	0 (0)	2 (66.7)	1 (33.3)	0 (0)	0 (0)	3 (0.2)
Tetanus	0 (0)	0 (0)	0 (0)	2 (66.7)	0 (0)	1 (0)	3 (0.2)
Diabetic Ketoacidosis*	0 (0)	0 (0)	0 (0)	1 (0)	0 (0)	1 (50)	2 (0.1)
Hemorrhagic Dx of the new born*	2 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (0.1)
Total→	87 (5.7)	1131 (57.1)	254 (12.9)	313 (15.9)	74 (3.8)	106 (5.4)	1965 (100)

“\*”= Non-communicable diseases, URTI: Upper respiratory tract infection, SCDx: Sickle cell disease, NN: Neonatal, UTI: Urinary tract infection, AGN: Acute glomerulonephritis, AFR: Acute renal failure, Dx: Disease.

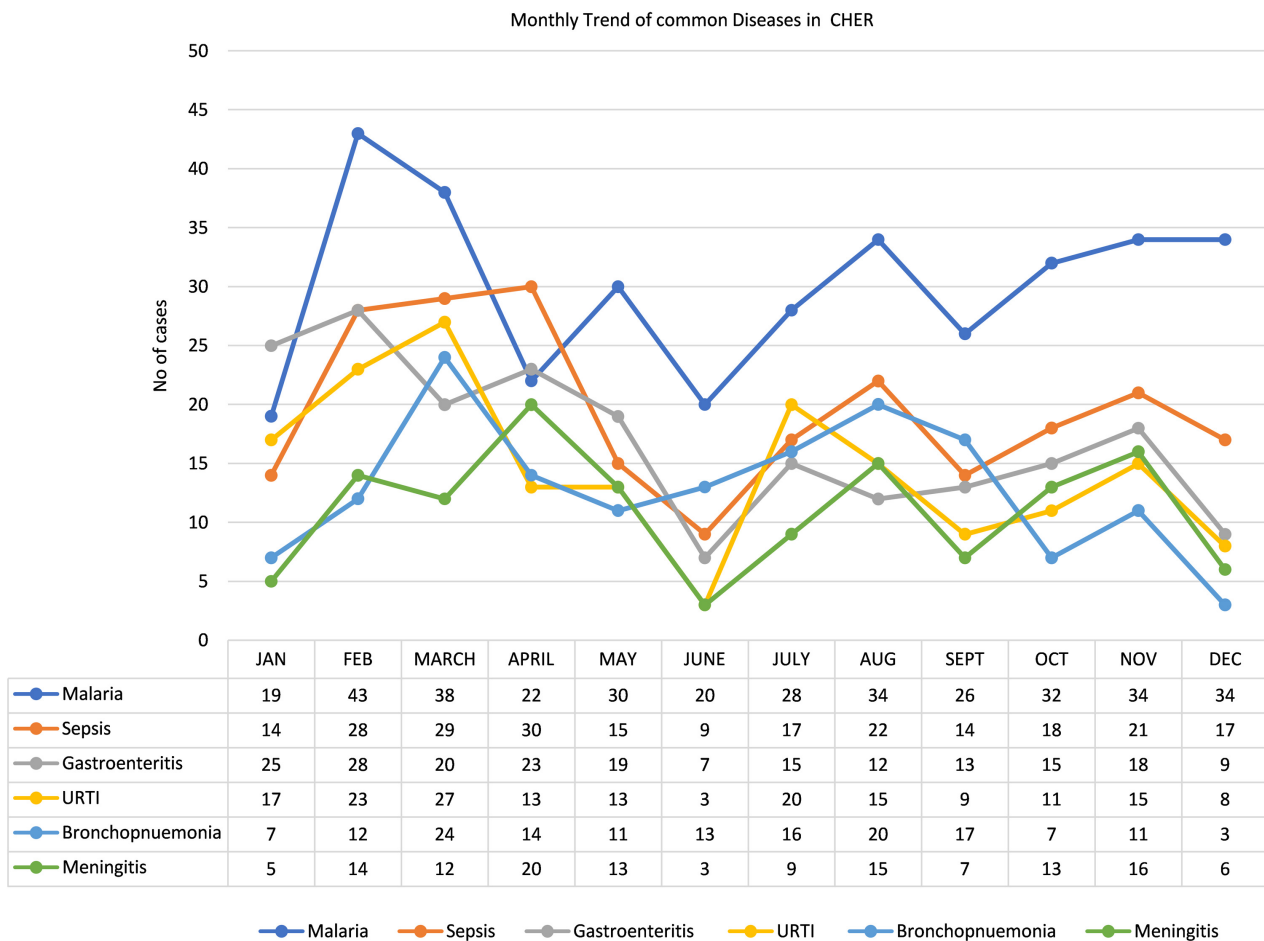


Figure 1. Common monthly disease pattern seen in CHER.

**The outcome of cases seen in CHER**

Mortality pattern: The mortality rate was highest among those aged > 12 years at 9.5% (7) while it was lowest among those aged 2 to <6 years at 1.2% (3). The age of one of the patients who died was not documented. The rate of mortality was also relatively more among females 3.2% (27) than males 3.0% (33). The mortality rate was also highest among children with underweight malnutrition 7.8% (13). Those with infectious diseases recorded a higher mortality rate of 3.8% (53) when compared to those with non-infectious diseases 1.3% (7).

Leaving hospital against medical advice: The highest proportion of patients who left the hospital against medical advice (LAMA) was seen among those aged < 2 years, 4.8% (58), while the LAMA rate was higher among female patients 4.7% (40) when compared to males 3.7% (40). LAMA was mostly seen among children with underweight malnutrition 6.6% (11), and the least recorded among children with normal nutritional status 3.4% (23). More Children with non-infectious diseases left the hospital against medical advice at 4.5% (24 when compared to those that had infectious diseases 4.0% (56).

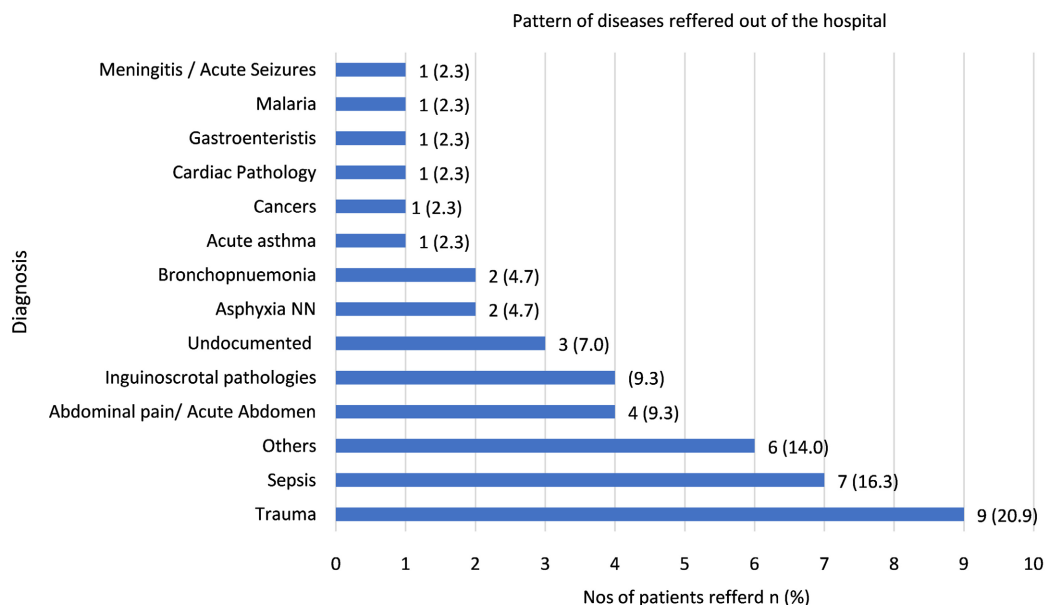
Cases referred out of the hospital: Cases that were referred out of the hospital were mostly cases seen among children aged < 2 yrs, 2.5% (31). The referral rate was more among females, 2.2% (19) than males, 2.1% (23), and highest among those that were overweight 5.1% (3). The rate was also higher among those with non-infectious diseases, 5.1% (27) when compared with those with infectious diseases 0.9% (13), see **Table 3**.

#### The pattern of diseases that were referred out of the hospital

The highest number of patients that were referred was those with trauma 20.9% (9) and sepsis 16.3% (7). The rate of referral was highest among those with inguinoscrotal pathology 30.8% (4), those with diagnoses classified as others 14.6% (6) cancers 12.5% (1), and asphyxia 12.5% (2) (**Figure 2** and **Figure 3**).

## 4. Discussion

Children within the first 5 years of life (74.9%) accounted for the highest age group seen in the children's emergency room (CHER) of the Rivers State University Teaching Hospital as also documented in other studies in Nigeria [1] [6] [7] [8] [9] South Africa [16] and India [21]. This is not surprising as this age



**Figure 2.** Pattern of diseases that get referred out of the hospital.



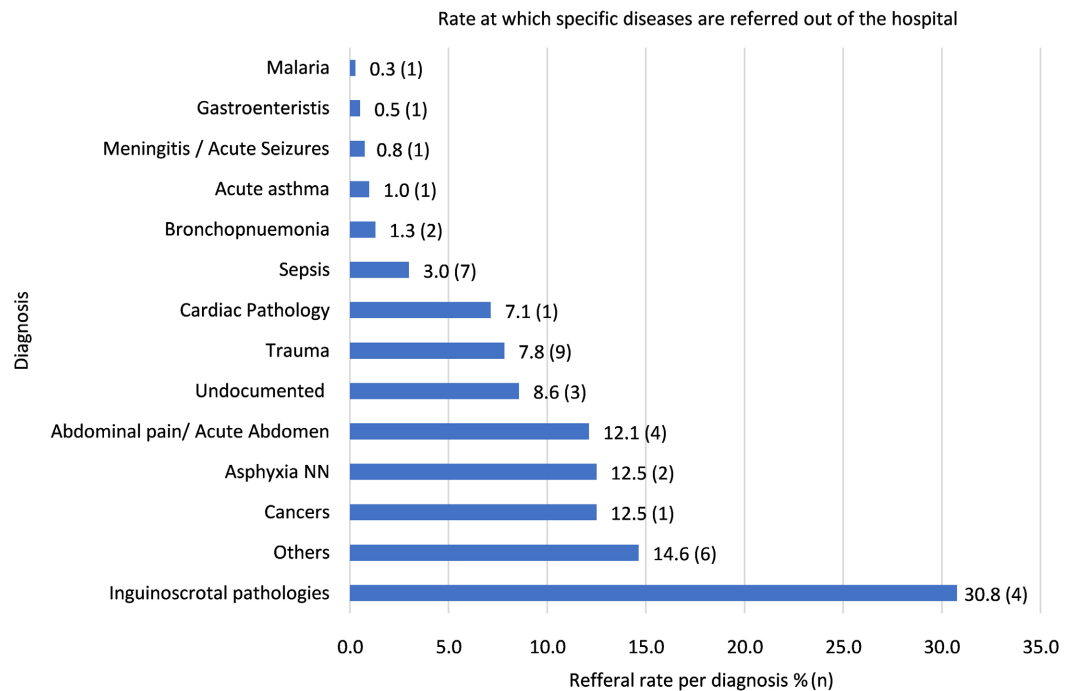
**Table 3.** Outcome of Emergency room consults by variables.

Variable	LAMA n = 81 (%WV; %WO)	Died = 62 (%WV; %WO)	Discharged/ transferred n = 893 (%WV; %WO)	Not admitted n = 886 (%WV; %TG)	Referred. n = 43 (%WV; %WO)	Total n (%WG)	
Age	<2 yrs	58 (4.8, 71.6)	42 (3.4, 67.7)	550 (45.2, 61.6)	537 (44.1, 60.6)	31 (2.5, 72.1)	1218 (62.0)
	2 to <6 yrs	9 (3.5, 11.1)	3 (1.2, 4.8)	120 (47.2, 13.4)	117 (46.1, 13.2)	5 (2.0, 11.6)	254 (12.9)
	6 to <12 yrs	6 (1.9, 7.4)	9 (2.9, 14.5)	146 (46.6, 16.3)	147 (47, 16.6)	5 (1.6, 11.6)	313 (15.9)
	>12 yrs	3 (4.1, 3.7)	7 (9.5, 11.3)	34 (45.9, 3.8)	30 (40.5, 3.4)	0 (0, 0)	74 (3.8)
	Unrecorded	5 (4.7, 6.2)	1 (0.9, 1.6)	43 (40.6, 4.8)	55 (51.9, 6.2)	2 (1.9, 4.7)	106 (5.4)
Sex	F	40 (4.7, 49.4)	27 (3.2, 43.5)	394 (46.2, 44.1)	372 (43.7, 42.0)	19 (2.2, 44.2)	852 (43.4)
	M	40 (3.7, 49.4)	33 (3.0, 53.2)	487 (45.0, 54.5)	499 (46.1, 56.3)	23 (2.1, 53.5)	1082 (55.1)
	Unrecorded	1 (3.2, 1.2)	2 (6.5, 3.2)	12 (38.7, 1.3)	15 (48.4, 1.7)	1 (3.2, 2.3)	31 (1.6)
W/A Zscore	>2	6 (4.5, 7.4)	1 (0.7, 1.6)	64 (47.8, 7.2)	59 (44.0, 6.7)	4 (3.0, 9.3)	134 (6.8)
	2 to -2	23 (3.4, 28.4)	16 (2.3, 25.8)	402 (58.9, 45.0)	228 (33.4, 25.7)	13 (1.9, 30.2)	682 (34.7)
	<-2	11 (6.6, 13.6)	13 (7.8, 21.0)	83 (49.7, 9.3)	56 (33.5, 6.3)	4 (2.4, 9.3)	167 (8.5)
	Unrecorded	41 (4.2, 50.6)	32 (3.3, 51.6)	344 (35, 38.5)	543 (55.3, 61.3)	22 (2.2, 51.2)	982 (50.0)
Infectious Dx	Yes	56 (4.0, 69.1)	53 (3.8, 85.5)	622 (44.4, 69.7)	656 (46.9, 74)	13 (0.9, 30.2)	1400 (71.2)
	No	24 (4.5, 29.6)	7 (1.3, 11.3)	255 (48.1, 28.6)	217 (40.9, 24.5)	27 (5.1, 62.8)	530 (27.0)
	Unrecorded	1 (2.9, 1.2)	2 (5.7, 3.2)	16 (45.7, 1.8)	13 (37.1, 1.5)	3 (8.6, 7.0)	35 (1.8)

WV = Within the variable, WO = within the outcome.

group is the most vulnerable paediatric age group that is susceptible to childhood diseases especially infectious diseases which likely could be attributed to their lower immunity as compared to the older age group [22] [23].

Males predominated with an M: F ratio of 1.3:1 in the present study. Similar reports were obtained in Nigeria [1] [5] [6] [7] [9] [10] [24], other African



**Figure 3.** Rate at which specific diseases get referred out of the hospital.

countries [11] [12], India [21] and Pakistan [22]. It is worthy of note that gender is a significant predictor of health in children with males showing greater vulnerability [25]. In contrast, however, female predominance was observed in a similar study in Bauchi State [9], Nigeria. The reason for this difference could not be ascertained.

More than two-thirds (71.2%) of the disease type seen among children presenting in the CHER were infectious/communicable diseases in consonance with the report by World Health Organization [26] [27]. This finding corroborates other studies in Nigeria [5] [7] [9] [24] [28] [29] and other African countries [30]. Preventable infectious diseases could be attributable to our poor environment, low socioeconomic conditions, and poor immunization coverage.

The commonest indication for emergency room visits in the present study was malaria accounting for 18.3% followed by sepsis (11.9%), gastroenteritis (10.4%), upper respiratory tract infection (8.8%), and bronchopneumonia (7.9%). Interestingly, the 5 commonest morbidities were all infectious diseases. Malaria is the commonest disease observed in the CHER in the present study and was also documented by Enyuma *et al.* [1], Umar *et al.* [6], Duru *et al.* [7], Sa'ad *et al.* [8], and Ezeonwu *et al.* [9], Ibeneme *et al.* [24], in Calabar, Yobe State, Bayelsa, Bauchi, Asaba, and Umuahia respectively, all in Nigeria. Malaria which is a disease of public health importance has been observed to be the commonest disease in Nigeria and many parts of Africa [31]. The burden and scourge of malaria on children especially the under-five can be reduced drastically by commencing appropriate treatment early and enforcing strategies to reduce its transmission. A similar study by Ibeziako & Ibekwe [5] in Enugu documented febrile convul-

sion as the commonest morbidity followed by severe malaria whereas studies carried out in India [21] and Pakistan [22] revealed respiratory illnesses as the commonest morbidity followed by gastrointestinal illnesses. The variations in the morbidity pattern observed above could be attributed to the varying geographic locations.

Trauma was observed as the commonest non-infectious condition in the present study followed by acute asthma and sickle cell anaemia in descending order. Contrary to the present study, sickle cell anaemia was documented as the commonest non-infectious condition in Calabar [1], Enugu [5], Yobe State [6], Bauchi [8], and Asaba [9] while acute asthma was documented in Abia State [10]. This difference could also be due to the varying geographic locations.

The trend of common diseases seen in the CHER in the present study revealed that the monthly incidence of malaria was consistently higher than other diseases throughout the year. This is not strange as the transmission of malaria occurs all year round in the southern part of Nigeria [32]. This is however not the case in Northern Nigeria where the transmission season is about 3 months or less [32]. The highest peak of malaria in the present study was in August which coincided with the wet season in Nigeria. A similar occurrence of malaria in the rainy season was also documented by Ezeonwu *et al.* [9] in Asaba, Southern Nigeria, and Ye *et al.* [33] in Nairobi, Kenya. Preventive measures such as the use of insecticide-treated nets, malaria chemoprophylaxis, indoor residual spraying, and good environmental sanitation would reduce the malaria burden in Africa.

Gastroenteritis peaked in January in the present study which coincided with the dry season. Thereafter, there was a decline in its' monthly incidence. This observation was also made in Asaba [9] and Umuahia [24]. During the dry seasons, water supply at the community level is in short supply which could make people resort to drinking any available water even if it's contaminated thereby increasing their risk of having gastroenteritis.

Bronchopneumonia had 2 peaks in the present study, August and March, the highest being in August which coincided with the wet season. A similar observation was made by Oloyede & Ijezie [34] in Uyo, Akwa Ibom State (Nigeria) in their 4 years retrospective study on paediatric patients. Other studies [35] [36] were also in consonance with the present study. This high incidence of bronchopneumonia during the wet season could be because viruses survive better at low humidity as seen in the wet season of the year [37] [38]. It could also be attributed to the fact that people tend to stay indoors during the rainy season leading to overcrowding which is a predisposing factor for pneumonia.

Of 1965 children seen in the CHER, 326 (16.6%) were transferred to the paediatric ward for further treatment. This was comparable to the 20.2% documented in Umuahia [24] but higher than the 13.4% in Calabar [1]. It was however much lower than the 37.6%, 44.3%, 50.0%, 69.7%, and 76.3% reported in Asaba [9], Enugu [5], Yobe State [6], Aba [10], and Bauchi [8] respectively. These variations could be the result of the different CHER bed occupancy as observed in the study in Asaba [9], which had a low bed occupancy of 7 with a

higher patient transfer rate of 37.6% as against the study carried out in Umuahia [24] and Calabar [1] with higher bed occupancies of 17 and 35 respectively with lower patient transfer rates of 20.2% and 13.4%. Variations in protocols in the different centres on the maximum duration of stay in the CHER could also be attributable. The low transfer rate in the present study could also be due to financial constraints as caregivers are expected to pay for paediatric ward services before a transfer is carried out. This thus leads to a longer duration of stay in the CHER.

Close to half (45.1%) of all the patients seen in the CHER were not admitted. This was higher than the 23.6% and 28.7% reported in Calabar [1], Nigeria and India [13] respectively but much lower than the 71.3% in Mozambique [8]. This high rate of non-admission in the emergency room as seen in the present study and Mozambique could mean that the CHER is also open to non-emergency cases or cold cases which should not be the case as it should be prioritized for only critical cases needing urgent attention. This high rate of consultation of cold cases in the CHER occurs especially during the weekends and after working hours in the evenings when the Paediatric outpatient clinics are not functional. The varying differences could also be due to varying standard operating procedures in the various emergency rooms as regards consultations of non-emergency cases.

A mortality rate of 3.2% obtained in the present study was comparable with the 4.0% and 4.1% reported in Umuahia [24], Eastern Nigeria, and Ethiopia [11] respectively but much lower than the 5.14%, 5.8%, 7.6%, 9.6%, 10.6% and 11.6% documented in Enugu [5], Asaba [9], Bayelsa [7], Aba [10], Bauchi [8] and Yobe State [6] respectively. It was however higher than the 2.5%, 1.6% and 0.5% documented in India [21], Mozambique [12] and Calabar [1] respectively. The low mortality rate reported in the present study could be because the mortality rate was based on the overall number of babies who presented in the children's emergency room while all other mortality rates were based on only the total number of children that were admitted. Other reasons that may have accounted for the varying mortality rates could be the varying inclusion criteria concerning age as seen in the study in Umuahia [24] where only under-fives were studied, unlike all others which studied children beyond 5 years although the age cut-off varied in the studies. The high mortality rate recorded in the study in Aba [10] could be due to the very short duration of the study of 5 months although done prospectively as against the present study which was carried out retrospectively over a 3 years period. These varying mortality rates could also be attributable to the varying geographic locations, the varying pattern of diseases as well as the availability of life-saving equipment, adequate support services, and health insurance as financial constraints play a huge role in disease morbidity and mortality [23].

There was a referral rate of 2.2% in the present study. This was higher than the 0.4%, 0.8%, and 1.0% reported in Umuahia [24], Asaba [9], and Yobe State [6] respectively but lower than the 3.3% in Bauchi [8]. There were no docu-

mented cases of referral to other health facilities in Calabar [1], Enugu [5], and Yobe State [6]. It was not surprising that our children's emergency unit had cases referred out. This hospital which was upgraded to a teaching hospital barely 3 years ago is still developing its subspecialties and manpower capacity. Surgical cases (Trauma cases and children with inguinoscrotal pathology) were the most referred cases and findings from this study suggest that the department of surgery in our facility needs more manpower to enable it to cater to the health needs of children that require surgical attention.

## 5. Conclusion

Children within the first 5 years of life constituted the most paediatric age group seen in the CHER of the RSUTH with male predominance. Infectious/communicable diseases accounted for more than two-thirds of all cases seen with malaria, sepsis, gastroenteritis, URTI, and bronchopneumonia being the five commonest diseases. The monthly incidence of malaria was higher than all other disease conditions throughout the year. The mortality rate among children presenting in the CHER was 3.2%. Thus, more drastic measures in the prevention, early, and proper treatment of malaria and other infectious diseases would reduce childhood morbidity and mortality.

## Limitation of the Study

This was a retrospective study and as such had some missing data.

## Acknowledgements

The authors express their gratitude to the staff and management of the Rivers State University Teaching Hospital, with special gratitude to the children's emergency unit for their corporation in carrying out this research.

## Conflicts of Interest

All the authors declare no conflict of interest.

## References

- [1] Enyuma, C.O., Anah, M.U., Pousson, A., Olorunfemi, G., Ibisomi, L., Abang, B.E., *et al.* (2019) Patterns of Paediatric Emergency Admissions and Predictors of Prolonged Hospital Stay at the Children Emergency Room, University of Calabar Teaching Hospital, Calabar, Nigeria. *African Health Sciences*, **19**, 1910-1923. <https://doi.org/10.4314/ahs.v19i2.14>
- [2] Bassey, E.U. and Ijezie, E. (2016) Pediatric Emergencies Seen in a Tertiary Hospital in Uyo, Akwa Ibom State of Nigeria: A Two-Year Review. *International Journal of Scientific Study*, **4**, 42-45.
- [3] Kisson, N. and Goldman, R.D. (2007) Pediatric Emergency Medicine: A World of Potential. *Canadian Journal of Emergency Medicine*, **9**, 453-455. <https://doi.org/10.1017/S1481803500015499>
- [4] NHS England (London Region) (2013) Children and Young People's Health Service

- es in London/A Case for Change. NHS England (London Region): Strategic Clinical Networks, 2013.
- [5] Ibeziako, S. (2002) Pattern and Outcome of Admissions in the Children's Emergency Room of the University of Nigeria Teaching Hospital, Enugu. *Nigerian Journal of Paediatrics*, **29**, 103-107. <https://doi.org/10.4314/njp.v29i4.12018>
- [6] Umar, U.I., Muhammed, I.L. and Gwarzo, G.D. (2018) Pattern and Outcome of Admissions at the Emergency Pediatric Unit of Federal Medical Centre Nguru, Yobe State, Nigeria. *Pyramid Journal of Medicine*, **1**, 1-5. <https://doi.org/10.4081/pjm.2018.1>
- [7] Duru, C., Peterside, O. and Akinbami, F. (2013) Pattern and Outcome of Admissions as Seen in the Niger Delta University Teaching Hospital, Bayelsa State, Nigeria. *Nigerian Journal of Paediatrics*, **40**, 232-237.
- [8] Sa'ad, Y.M., Hayatu, A., Al-Mustapha, I.I., Orahachi, Y.M. and Hauwa, M.U. (2015) Morbidity and Mortality of Childhood Illnesses at the Emergency Pediatric Unit of a Tertiary Hospital, North-Eastern Nigeria. *Sahel Medical Journal*, **18**, 1-3. <https://doi.org/10.4103/1118-8561.152150>
- [9] Ezeonwu, B., Chima, O., Oguonu, T., Ikefuna, A. and Nwafor, I. (2014) Morbidity and Mortality Pattern of Childhood Illnesses Seen at the Children Emergency Unit of Federal Medical Center, Asaba, Nigeria. *Annals of Medical and Health Science Research*, **4**, S239-S244. <https://doi.org/10.4103/2141-9248.141966>
- [10] Okoronkwo, N.C. and Chappjumbo, A.U. (2015) Pattern of Morbidity and Mortality of Childhood Illnesses at the Children Emergency Room of Abia State University Teaching Hospital, Aba, Nigeria. *The East and Central Africa Medical Journal*, **3**, 73.
- [11] Jofiro, G., Jemal, K., Beza, L. and Bacha Heye, T. (2018) Prevalence and Associated Factors of Pediatric Emergency Mortality at Tikur Anbessa Specialized Tertiary Hospital: A 5 Year Retrospective Case Review Study. *BMC Pediatrics*, **18**, Article No. 316. <https://doi.org/10.1186/s12887-018-1287-4>
- [12] Brugnolaro, V., Fovino, L.N., Calgaro, S., Putoto, G., Muhelo, A.R., Gregori, D., *et al.* (2020) Pediatric Emergency Care in a Low-Income Country: Characteristics and Outcomes of Presentations to a Tertiary-Care Emergency Department in Mozambique. *PLOS ONE*, **15**, e0241209. <https://doi.org/10.1371/journal.pone.0241209>
- [13] Islam, S.M., Purnat, T.D., Phuong, N.T., Mwingira, U., Schacht, K. and Fröschl, G. (2014) Non-Communicable Diseases (NCDs) in Developing Countries: A Symposium Report. *Global Health*, **10**, 81. <https://doi.org/10.1186/s12992-014-0081-9>
- [14] Calvello, E.J., Tenner, A.G., Broccoli, M.C., Skog, A.P., Muck, A.E., Tupesis, J.P., *et al.* (2016) Operationalising Emergency Care Delivery in Sub-Saharan Africa: Consensus-Based Recommendations for Healthcare Facilities. *Emergency Medicine Journal*, **33**, 573-580. <https://doi.org/10.1136/emmermed-2015-204994>
- [15] Forae, G.D., Uchendu, O.J. and Igbe, A.P. (2014) An Audit of Paediatric Mortality Patterns in a Nigerian Teaching Hospital. *Nigerian Medical Journal*, **55**, 130-133. <https://doi.org/10.4103/0300-1652.129644>
- [16] Joseph, T. (2020) Patterns of Mortality in Children Presenting to a Tertiary Pediatric Emergency Room in Sub-Saharan Africa: A Cross-Sectional Study.
- [17] Anyanwu, O.U., Ezeanosike, O.B. and Ezeonu, T.C. (2014) Pattern and Outcome of Admissions at the Children Emergency Room at the Federal Teaching Hospital Abakaliki. *African Journal of Medical and Health Sciences*, **12**, 6-10.
- [18] Enyuma, C., Ikpeme, O., Brown-Abang, E. and Uket, H. (2016) Morbidity and Mortality in a Children Emergency Room in Calabar. *Journal of Medicine in Africa*,

- 1, 6-10.
- [19] Njokanma, F.O., Nkanginieme, K.E.O. and Iguodala, O. (2016) Growth and Development. In: Azubuikwe, J.C. and Nkanginieme, K.E.O., Eds., *Paediatrics and Child-health in a Tropical Region*, 3rd Edition, Educational Printing and Publishing, Lagos, 201-214.
- [20] Feigelman, S. (2016) Growth, Development and behavior, Part II. In: Kliegman, R.M., Stanton, B.F., St Geme III, J.N. and Behrman, R.E., Eds., *Nelson Textbook of Paediatrics*, 20th Edition, Elsevier, Philadelphia, 48-83.
- [21] Singhi, S., Jain, V. and Gupta, G. (2003) Pediatric Emergencies at a Tertiary Care Hospital in India. *Journal of Tropical Pediatrics*, **49**, 207-211. <https://doi.org/10.1093/tropej/49.4.207>
- [22] Gowa, M.A., Habib, I., Tahir, A., Yaqoob, U. and Junejo, S. (2019) Disease Spectrum and Frequency of Illness in Pediatric Emergency: A Retrospective Analysis from Karachi, Pakistan. *The Ochsner Journal*, **19**, 340-346. <https://doi.org/10.31486/toj.18.0134>
- [23] Molyneux, E. (2001) Paediatric Emergency Care in Developing Countries. *The Lancet*, **357**, 86-87. [https://doi.org/10.1016/S0140-6736\(00\)03536-4](https://doi.org/10.1016/S0140-6736(00)03536-4)
- [24] Ibeneme, C.A., Ezuruikwe, E.O., Korie, F.C., Chukwudi, N.K. and Ukpabi, I.K. (2019) Morbidity Pattern and Outcome among Under-Fives at the Children Emergency Room of Federal Medical Centre Umuahia. *The Nigerian Journal of Paediatrics*, **46**, 189-194. [https://doi.org/10.4103/ijmh.IJMH\\_9\\_19](https://doi.org/10.4103/ijmh.IJMH_9_19)
- [25] Nuñez, J.L. and McCarthy, M.M. (2003) Sex Differences and Hormonal Effects in a Model of Preterm Infant Brain Injury. *Annals of the New York Academy of Sciences*, **1008**, 281-284. <https://doi.org/10.1196/annals.1301.032>
- [26] World Health Organization (2020) Children: Reducing Mortality. Fact Sheet. 178.
- [27] World Health Organization (2000) Health System: Improving Performance. World Health Organization, Geneva.
- [28] Abhulimhem-Iyoha, B.I. and Okolo, A.A. (2012) Morbidity and Mortality of Childhood Illnesses at the Emergency Paediatric Unit of the University of Benin Teaching Hospital, Benin City. *Nigerian Journal of Paediatrics*, **39**, 71-74. <https://doi.org/10.4314/njp.v39i2.7>
- [29] Edelu, B.O., Eze, J.N., Oguonu, T. and Ndu, I.K. (2014) Morbidity and Mortality Pattern in Children Emergency Room of University of Nigeria Teaching Hospital, Enugu. *Orient Journal of Medicine*, **26**, 73-75.
- [30] Brewster, D.R. and Greenwood, B.M. (1993) Seasonal Variation of Paediatric Diseases in the Gambia, West Africa. *Annals of Tropical Paediatrics*, **13**, 133-146. <https://doi.org/10.1080/02724936.1993.11747637>
- [31] National Center for Infectious Diseases, Division of Parasitic Diseases (2004) Geographic Distribution and Epidemiology of Malaria. Information on Malaria.
- [32] Severe Malaria Observatory, WHO (2012) Knowledge Sharing for Severe Malaria: Severe Malaria.
- [33] Ye, Y., Zulu, E., Mutisya, M., Orindi, B., Emina, J. and Kyobutungi, C. (2009) Seasonal Pattern of Pneumonia Mortality among Under-Five Children in Nairobi's Informal Settlements. *American Journal of Tropical Medicine and Hygiene*, **81**, 770-775. <https://doi.org/10.4269/ajtmh.2009.09-0070>
- [34] Oloyede, I.P. and Ijezie, E. (2020) Epidemiological and Seasonal Variations of Pneumonia in Children admitted in the University of Uyo Teaching Hospital, Uyo, Akwa Ibom State, Nigeria: A Retrospective 5-Year Study (2013-2017). *Nigerian*

---

*Journal of Paediatrics*, **47**, 42-47.

- [35] Oguonu, T., Adaeze Ayuk, C., Edelu, B.O. and Ndu, I.K. (2014) Pattern of Respiratory Diseases in Children Presenting to the Paediatric Emergency Unit of the University of Nigeria Teaching Hospital, Enugu: A Case Series Report. *BMC Pulmonary Medicine*, **14**, Article No. 101. <https://doi.org/10.1186/1471-2466-14-101>
- [36] Paynter, S., Ware, R.S., Lucero, M.G., Tallo, V., Nohynek, H., Simões, E.A.F., *et al.* (2013) Poor Growth and Pneumonia Seasonality in Infants in the Philippines: Cohort and Time Series Studies. *PLOS ONE*, **8**, e67528. <https://doi.org/10.1371/journal.pone.0067528>
- [37] Tamerius, J., Nelson, M.I., Zhou, S.Z., Viboud, C., Miller, M.A. and Alonso, W.J. (2011) Global Influenza Seasonality: Reconciling Patterns across Temperate and Tropical Regions. *Environmental Health Perspectives*, **119**, 439-445. <https://doi.org/10.1289/ehp.1002383>
- [38] Yusuf, S., Piedimonte, G., Auais, A., Demmler, G., Krishnan, S., Van Caesele, P., *et al.* (2007) The Relationship of Meteorological Conditions to the Epidemic Activity of Respiratory Syncytial Virus. *Epidemiology & Infection*, **135**, 1077-1090. <https://doi.org/10.1017/S095026880600776X>

## Abbreviations

CHER: Children emergency room

LAMA: Left against medical