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Patterns of paediatric emergency admissions and predictors of prolonged hospital stay at the children emergency room, University of Calabar Teaching Hospital, Calabar, Nigeria

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Abstract

Background: There is a high prevalence of paediatric emergency cases in less developed countries. However, prolonged hospital stay at emergency units may further overstretch the facilities.

Objective: To assess the patterns of presentations, services offered and predictors of a prolonged stay at the Children Emergency Room of a tertiary hospital in Southern Nigeria.

Methods: This prospective cross-sectional, study was conducted at the University of Calabar Teaching Hospital, Nigeria from 1st January–31st December 2014. Socio-demographic and clinical characteristics of consecutively recruited children (n=633) were recorded in a proforma. Binary logistic regression was conducted to determine predictors of prolonged stay (>72 hours)

Result: The median age of participants was 2 (1 - 4.6) years. Three-fifths of children were admitted at off-hours and the commonest symptom was fever (73.9%). About 16.4% (95%CI:13.6% - 19.4%, n= 103/633) of the children had prolonged stay while those with sepsis had the longest mean stay (65.5±72.1 hours). Children admitted on account of Sickle cell disease (OR:11.2, 95%CI:1.3-95.1, P-value = 0.03), Malaria (OR:10.7, 95%CI:1.4-82.5, P-value = 0.02) or sepsis (OR:10.5, 95%CI:1.3 - 82.7, P-value = 0.03) had higher odds of prolonged hospital stay. There was no significant difference in hospital stay among children admitted by the consultant as compared to other health personnel (P-value = 0.08).

Conclusion: Prevention and proper management of Sickle cell disease and malaria reduces paediatric hospital stay in our environment. Paediatric emergency medicine should be re-organized to cater for high volume of off-hour admissions.

Keywords: Paediatric emergency, paediatric emergency admissions, predictors of prolonged stay, children emergency unit.

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Introduction

Emergency medicine is a dynamically complex and well-coordinated specialty. However, paediatric emergency sub-specialty is not yet well developed in most low and middle income countries (LMICs). In most LMICs, children emergency units (CHEU) are managed by generalist paediatricians with minimal expertise in paediatric emergency medicine.[1–4] Thus, critical gaps in paediatric emergency care exist which may negatively impact outcomes. The situation is worse in Nigeria, where the ratio of paediatrician per population is low.[2,5–7]

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The prevalence of preventable communicable diseases (such as malaria, pneumonia and diarrhoeal diseases) is high in sub-Saharan African Countries.[8–12] The aforementioned diseases are commoner among the under-fives, who account for over 70% of paediatric emergency admissions.[11,13–15] In addition to the high burden of paediatric infectious disease, there is at present an increasing incidence of non-communicable and hereditary diseases and their complications. This includes sickle cell disease, diabetes mellitus and hypertension.[2,16–20]

Mortality rates in the Children Emergency Room (CHER) in Nigeria ranged from 2-17.5%, with about 40% of deaths occurring in the first 24 hours of admission.[2,11,12,15,18,21–25] Late presentation, delayed interventions, financial constraints, unavailability of life saving equipment and inadequate support services may play a role in this observed mortality pattern.[3,12,18,23,26]

At CHER, children are typically triaged, resuscitated and then transferred to either paediatric lying-in ward or discharged to be followed up at children out-patient's clinic(CHOP).[24] To prevent overcrowding in CHER, target length of stay (LOS) for patient disposition is set at 48-72 hours in Nigeria and 4-8 hours in most developed countries.[21,27,28] However, factors such as patient inflow, CHER admission and discharge processes, as well as hospital bottlenecks and level of facilities may contribute to prolonged hospital stay. Prolonged hospital stay may cause: socio-cognitive problems to the child; socio-economic burdens to the parents and increased constraints on the health facility resources.[27–29]

Although pattern of presentations and predictors of paediatric hospital stay has been reported in the high income countries[30–33], little is known currently in our environment.

We therefore, conducted this study to assess the current pattern of presentations and outcomes, including predictors of prolonged stay at CHER of the University of Calabar Teaching Hospital (UCTH), Southern Nigeria to inform policy and improve paediatric emergency practice in our environment.

Materials and methods

This was a prospective cross-sectional study of consenting consecutive children admitted to the CHER of UCTH, Calabar, Southern Nigeria from 1st January to 31st December 2014.

The children emergency unit has continuously been reorganized for improved performance. It has a triage area, two consulting areas, a resuscitation area, a procedure area, a short stay ward of 35 beds and in addition a diarrhoea treatment and training unit (DTTU) of 6 beds with carefully laid out patients flow plan.

Since 2013, a resident doctor triages all newly presented children using the South African Triage Score.[34] A consultant paediatrician is permanently posted to the unit, and also reviews all patients within 2 hours of admission during week days. All paediatric subspecialty consultants conduct ward rounds and take calls in CHER. Hand-over rounds are conducted at 8:00 am and 4pm daily and mortalities are reviewed weekly. The unit policy is to see all patients within 15 minutes of arrival and dispose within 72 hours except the unstable patients that need continued care.

After initial stabilization, the parent or guardian of consecutive patients was approached for recruitment by the research team. , Informed consent was obtained from consecutively recruited participants. Those that declined consent were excluded from the study. Information was continually retrieved from patients' file and entered into the research proforma by the paediatric residents, who were trained about data extraction and blinded to the study objectives. The principal investigator randomly cross checked the data entry with the records in the actual file. Missing data was cross-checked from the original files.

The information extracted included; time of arrival and time of review by medical personnel, cadre of doctor that first saw the patient, immunization status, presenting complaint, treatment instituted at home, signs elicited, working diagnosis, investigations requested, treatment received, duration of stay (calculated from time of admission and time of discharge in hours) and discharge diagnosis. Diagnosis was based on International classification of Diseases (Tenth revision) (ICD-10). The outcome measured were discharges, duration of stay, transferred out, Discharged against medical advice (DAMA), absconded and death. Daily updates of the records of each patient were done until the patient was discharged from CHER. Ethical approval was obtained from the hospital health and research ethics committee (HREC). There was no intervention and the information recorded in the proforma was anonymized.

Data analysis

Data was entered into excel spread sheet (microsoft®Excel® 2010) from the proforma and exported to Stata version 14 (Stata corp®2015 College station TX) Statistical software. Descriptive statistics was conducted and categorical variables were expressed as frequencies, percentages and charts. Normally distributed continuous variables were presented as means and standard deviations (SD) while non-normally distributed continuous variables were presented as median and interquartile range (IQR). Length of hospital stay was categorized into prolonged (≥72 hours) and non-prolonged stay (<72 hours). The categorical clinical and socio-demographic characteristics were compared based on hospital stay classifications using a Pearson's Chi-square (Fishers exact test was utilized if the expected cell was less than 5). Student's t-test and Mann Whitney U was respectively used to determine an association between normally and non-normally distributed continuous variables and the duration of stay (prolonged/non-prolonged). Analysis of variance was used to compare the mean length of stay among groups. Post hoc Bonferroni test was conducted for the statistically significant ANOVA values. Univariable binary logistic regression was conducted between explanatory variables and the outcome (prolonged or non-prolonged hospital stay). Multivariable binary logistic regression was then conducted with explanatory variables that had P-value <0.2 from univariable analysis. Age and cadre of admitting staff were however pre-determined a priori based on literature and the experience of the researchers. Adjusted odds ratio with 95% confidence intervals was reported for predictors of prolonged hospital stay. Two-tailed test of hypothesis was assumed. Statistically significant level was set at P-value<0.05.

Results

Study population and socio-demographic characteristics:

Of the 2,023 children that presented to CHEU during the study period, 633 (76.4%) were admitted into CHER and recruited into the study while 195 (23.6%) were admitted into DTTU and 1,195 (59.1%) went home (See Figure 1) Over two-thirds (410/633; 77.5%) of the patients were five years and below, and the median age (interquartile range) was 2 (1 - 4.6) years. The male to female ratio was 1.3:1. (Table 1)

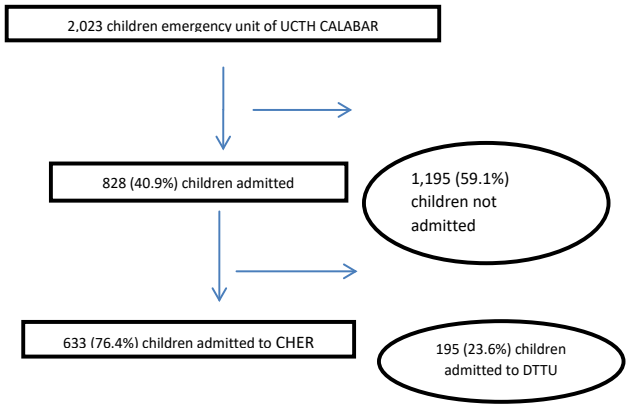


Figure 1: Flow chart of the study participants.

Table 1: Comparison of the socio-demographic and clinical characteristics of children by duration of stay in the hospital

Characteristics	Less 72 hours	Prolonged stay (> 72 hours)	Total	95% CI	Test-statistics	P-values
Age (years) (median (IQR))	2 (1.0 - 4.6)	(1.0 - 4.7)	2 (1 - 4.6)		0.22^	0.8224
≤ 1	119(22.5)	25 (24.0)	144 (22.8)	19.6 – 26.2	0.67#	0.881
1-5	291(55.0)	59 (56.7)	350 (55.3)	51.4 – 59.1		
6-12	91(17.2)	16 (15.4)	107 (16.9)	14.2 – 20.0		
>12	28 (5.3)	4 (3.9)	32 (5.1)	3.6 – 7.1		
Gender						
Female	237 (44.9)	37 (35.6)	274 (43.4)	39.5 – 47.3	3.07#	0.080
Male	291(55.1)	67 (64.4)	358 (56.7)	52.7 – 60.5		
‡**Tribe/Ethnicity**						
South	117 (22.1)	21 (20.2)	138 (21.8)	18.7 - 25.2	5.55#	0.235
Central	80 (15.1)	21 (20.2)	101 (16.0)	13.3 - 19.0		
North	59 (11.2)	14 (13.5)	73 (11.5)	9.3 - 14.3		
Akwa Ibom	161 (30.4)	35 (33.7)	196 (31.0)	27.5 - 34.7		
Others	112 (21.2)	13 (12.5)	125 (19.8)	16.8 - 23.0		
Period of presentation$						
Morning	238 (45.0)	39 (37.5)	277 (43.8)	39.9 - 47.7	3.08#	0.214
Afternoon	201 (38.0)	49 (47.1)	250 (39.5)	35.7 – 43.4		
Night	90 (17.0)	16 (15.4)	106 (16.8)	14.0 – 19.9		
Ω Mode of referral						
Self	420 (79.4)	81 (77.9)	501 (79.2)	75.8 - 82.1		0.891*
PHC	3 (0.57)	0 (0.0)	3 (0.5)	0.2 – 1.5		
SHC	20 (3.8)	5 (4.8)	25 (4.0)	2.7 - 5.8		
CHOP	85 (16.1)	18 (17.3)	103 (16.3)	13.6 – 19.4		
Others	1 (0.2)	0 (0.00)	1 (0.16)	0.0 – 1.1		
Prior treatment						
Home remedy	266 (50.3)	55 (52.9)	321 (50.7)	46.8 - 54.6		0.022*
Health facility	78 (14.7)	16 (15.4)	94 (14.9)	12.3 -17.9		
Alternative care facility	0 (0.0)	1 (0.96)	1 (0.2)	0.0 -1.1		
Multiple	162 (30.6)	22 (21.2)	184 (29.1)	3.7 - 7.3		
None	23 (4.4)	10 (9.6)	33 (5.2)	25.7 - 32.7		
Admitting Doctor						
House officer	106 (20.0)	18 (17.3)	124 (19.6)	16.7 - 22.9	2.80#	0.424
Junior resident	260 (49.2)	50 (48.1)	310 (49.0)	45.1 - 52.9		
Senior resident	145 (27.4)	29 (27.9)	174 (27.5)	24.1 - 31.1		
Consultant	18 (3.4)	7 (6.7)	25 (4.0)	2.7 - 5.8		
Duration of illness (Hours) (Median (IQR))	4 (2 - 5)	4.5 (3 - 5)	4 (2 - 5)		0.06^	1.891
≤12	67 (12.7)	10 (9.6)	77 (12.2)	9.8 – 15.0	4.06#	0.397
13-24	95 (18.0)	15 (14.4)	110 (17.4)	14.6 – 20.5		
25-48	76 (14.4)	11 (10.6)	87 (13.7)	11.3 – 16.7		
49-72	76 (14.4)	16 (15.4)	92 (14.5)	12.0 – 17.5		
>72	215 (40.6)	52 (50.0)	267 (42.2)	38.4 – 46.1		
Diagnosis at discharge						
Malaria	128 (24.2)	33 (31.7)	161 (25.4)	22.2 – 29.0	9.46	0.149
Sepsis/Meningitis	51 (9.6)	13 (12.5)	64 (10.1)	8.0 - 12.7		
Respiratory pathology	220 (41.6)	40 (38.5)	260 (41.1)	37.3 – 45.0		
Sickle Cell Anaemia	44 (8.3)	10 (9.6)	54 (8.5)	6.6– 11.0		
αGIT pathology	45 (8.5)	7 (6.7)	52 (8.2)	6.3- 10.6		
Surgical/ Burns	29 (5.5)	1 (1.0)	30 (4.7)	3.3 - 6.7		
Others	12 (2.3)	0 (0.0)	12(1.9)	1.1 - 3.3		
Outcomes						
Discharge	417 (78.9)	1 (0.96)	418 (66.0)	62.2 - 69.6		<0.001*
Transferred	85 (16.1)	0 (0.0)	85 (13.4)	11.0 - 16.3		
DAMA	21 (4.0)	0 (0.0)	21 (3.3)	2.2 - 5.0		
Absconded	3 (0.6)	0 (0.0)	3 (0.5)	0.2 - 1.5		
Died	3 (0.6)	0 (0.0)	3 (0.5)	0.2 - 1.5		
Prolong stay	0 (0.0)	103 (99.0)	103 (16.3)	13.6 - 19.4		

#: Chi-square, * Fisher exact ^ Mann Whitney U test :
‡South, Central and North = the senatorial districts in Cross River State, $morning shift: 8.00 – 14.00hr; Afternoon shift: 14.00 – 22.00hr; Night shift: 22.00 – 8.00hr,DAMA = Discharge Against Medical Advice, αGIT = GastroIntestinal Tract, ΩPHC = Primary Health Care facility, SHC = Secondary Health Care facility, CHOP = Children Out-Patient clinic.

Clinical characteristics and presentations:

About one-third (n=187/633; 29.5%) of participants presented within 24 hours of illness and almost half (n=277/633; 43.8%) presented during the morning shift. Majority (501/633; 79.2%) were not formally referred. About half (n=321/633; 50.7%) had received home remedy and only about 15% (94/633) previously accessed peripheral health care facilities in current illness. (Table 1) Almost all participants (n=627, 99.1%) had completed routine immunizations for age and about half (49.0%, 310/633) were first seen by Junior Resident doctors. (Table 1)

The common presenting symptoms were: history of fever (n=468/633; 73.9%), and cough (n=239/633; 37.7%) though, some presented with multiple symptoms. (Figure 1)

The common diagnoses at admission were: respiratory tract infections (n=341, 53.7%), and malaria (n=332, 52.4%). (Figure 2) Their final diagnoses did not differ significantly. (Table 1)

Hospital interventions and outcomes:

Majority (n=430/633; 67.9%) of the patients received intervention within 30 minutes of arrival. At discharge, four-fifth (82.3%; n=521/633) of patients received antibiotics though only 22% (n=182/633) had a blood culture result. Forty (6.3%;n=40/633) children received blood transfusion, the majority (31/40; 77.5%) were due to anaemia from severe malaria. (Table 2)

Table 2: Distribution of the various interventions received by the children at the Children emergency Room of UCTH, Calabar, Nigeria

Interventions , N= 633	Frequency (%)
Antibiotics	
Parenteral	480 (75.8)
Oral	41 (6.5)
Fluids	
IVF	211 (33.3)
ORT	43 (6.8)
ORT/IVF	35 (5.5)
Resomal	1 (0.2)
10% dextrose bolus	4 (0.6)
Asthmatic treatment	
Bronchodilator/steroid	92 (14.5)
Hydrocortisone./salbutamol nebules	64 (69.6)
Prednisolone/salbutamol nebules	4 (4.4)
Hydrocortisone/Aminophylline	2 (2.2)
Steam inhalation	22 (23.9)
Oxygen	56 (8.8)
NaHco3	8 (1.3)
Suction	6 (0.9)
Transfusion	40 (6.3)
Diazepam	43 (6.8)

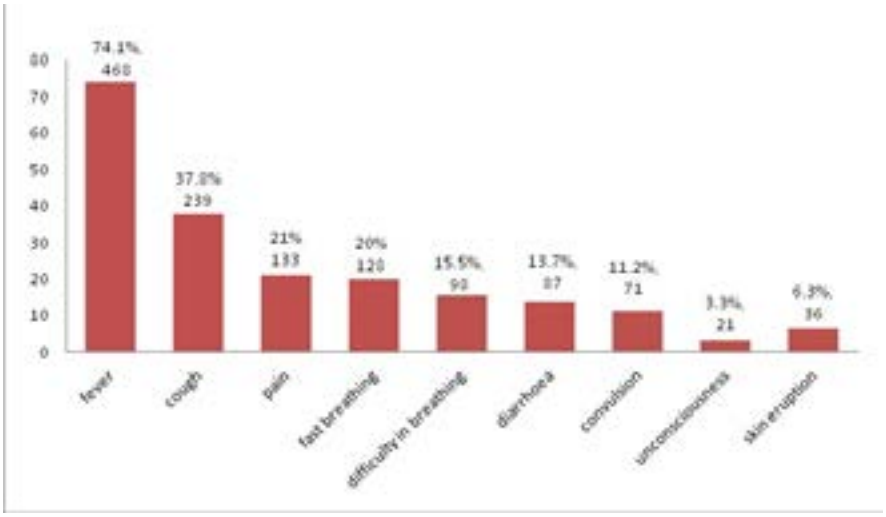


Figure 2: Distribution of presenting symptoms of children admitted to the children emergency Room of UCTH, Calabar, Nigeria

The mortality rate in this study was low (n=3/633; 0.5%). (Table 1)

Length of stay:

The minimum and maximum length of stay was 0.5 hours and 456 hours respectively while the median length of stay (interquartile range) was 48 (24-72) hours. About 16.4% (95%CI:13.6% - 19.4%, n= 103/633) of children had prolonged hospital stay and children with sepsis/ meningitis had the longest mean hospital stay (65.5±72.1 hours) followed by malaria (61.5±36.9 hours) and sickle cell anaemia (59.0± 35.9 hours). While surgical cases (30.9±26.4 hours) had the least hospital stay. Children that had prior treatment at non-orthodox facilities had highest mean hospital stay (216.0±0.0 hours). (Table 3A) Post hoc Bonferroni test of pair-wise difference in mean length of stay is as shown in Table 3B below

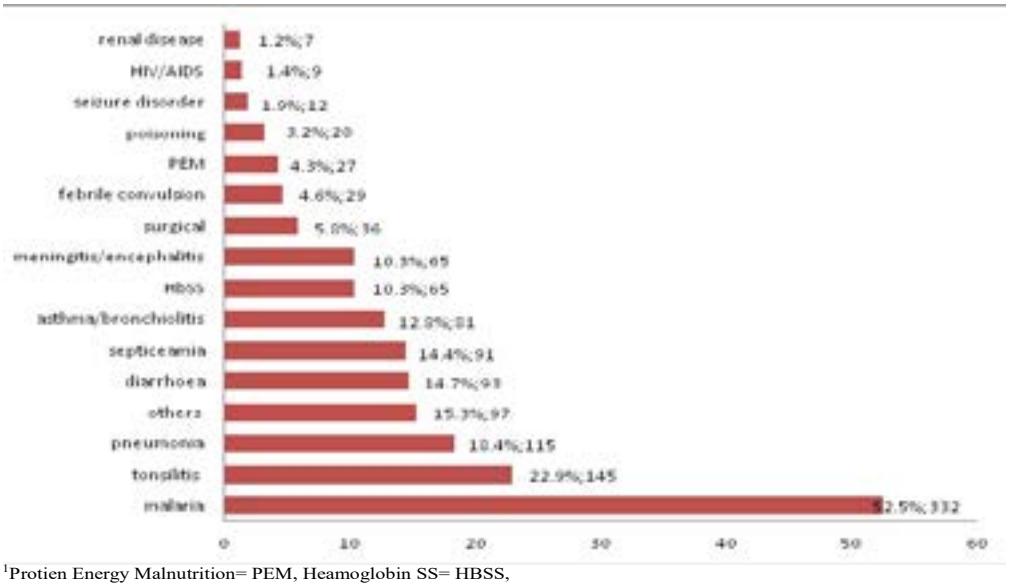
Table 3A. The mean length of stay of children admitted to CHER

Characteristics	(Mean± SD) hours	P-value
Age (years)		
≤ 1	60.3±37.1	0.3862^
1-5	54.5±43.5	
6-12	52.6±35.1	
>12	51.9±39.9	
Gender		
male	57.2 ±43.9	0.2117[#]
Female	53.1 ±35.7	
[‡]**Tribe/Ethnicity**		
South	51.1±37.7	0.2760^
Central	62.1±38.0.	
North	53.1±39.6	
Akwa Ibom	57.0±48.4	
Others	53.4±31.7	
Period of presentation[$]		
Morning	53.8±42.1	0.4949^
Afternoon	57.7±40.3	
Night	53.9±37.0	
[Ω]**Mode of referral**		
Self	55.8±41.4	0.9897^
PHC	48.0±0.0	
SHC	54.1±46.5	
CHOP	54.1±35.6	
Others	48.00±0.0	
Prior treatment		
Home remedy	55.0±32.3	<0.0001^
Health facility	60.1±42.9	
Alternative carefacility	216.0±0.0	
Multiple	48.6±38.4	
None	78.5±81.5	
Admitting Doctor		
House officer	53.0±52.3	0.8334^
Junior resident	55.1±38.3	
Senior resident	57.2±33.0	
Consultant	57.9±50.8	
Duration of illness (Hours)		
≤12	47.2±37.9	0.1962^
13-24	55.4±35.1	
25-48	52.1±37.8	
49-72	54.4±34.0	
>72	59.1±45.8	
Diagnosis at discharge		
Malaria	61.5±36.9	0.0001^
Sepsis/Meningitis	65.5±72.1	
Respiratory pathology	52.8± 33.3	
Sickle Cell Anaemia	59.0± 35.9	
[α]GIT pathology	53.0.± 37.3	
Surgical/ Burns/ Others	30.9±26.4	
Outcomes		
Early discharge	45.0±22.0	<0.0001^
Transferred	39.3±24.5	
DAMA	17.9±14.4	
Absconded	17.0±6.0	
Died	18.7±25.6	
Prolong stay	120.5±48.6	

^ =ANOVA (Analysis of Variance); [#] student's t-test

Table 3B. Pairwise Post Hoc Bonferroni test of mean stay among categories of variables

Prior treatment						
	Home remedy/ Alternative care facility	**Health facility**	**Multiple Treatment**	**None**		
Home remedy/ Alternative care facility	1.00					
Health facility	1.000	1.00				
Multiple Treatment	0.383	0.146	1.00			
None	0.011*	0.144	0.001*	1.00		
Diagnosis at discharge						
	Malaria	**Sepsis/Meningitis**	**Respiratory pathology**	**Sickle cell Anaemia**	**GIT Pathology**	**Surgical /Burns/others**
Malaria	1.00					
Sepsis/Meningitis	1.000	1.00				
Respiratory pathology	0.439	0.335	1.00			
Sickle Cell Anaemia	1.000	1.000	1.000	1.00		
[a]GIT pathology	1.000	1.000	1.000	1.000	1.00	
Surgical/ Burns/ Others	0.001*	0.001*	0.016*	0.010*	0.121	1.00
Outcomes						
	Early Discharge	**Transferred**	**DAMA**	**Absconded**	**Died**	**Prolong Stay**
Early Discharge	1.00					
Transferred	1.000	1.00				
DAMA	0.001*	0.029*	1.00			
Absconded	1.000	1.000	1.000	1.00		
Died	1.000	1.000	1.000	1.000	1.00	
Prolong stay	<0.001*	0.001*	0.001*	0.001*	0.001*	1.00
***Statistically significant pairwise difference**						



[1]Protien Energy Malnutrition= PEM, Heamoglobin SS= HBSS,

Figure 3: Distribution of diagnosis of children admitted to the children emergency Room of UCTH, Calabar, Nigeria

Predictors of prolonged hospital stay:

At univariable analysis, treatments before presentation and diagnosis at discharge were associated with prolonged stay. (Table 4)

From multivariable analysis, children that had prior multiple treatments, home or herbal remedy or that visited another health facility before presentation had 59%, 74% and 61% lesser chance of staying beyond 72 hours as compared to children that did not. Furthermore, children whose final diagnosis were SCA, malaria, sepsis or respiratory illness had 11.2-,10.7-,10.2- , and 7.6-fold increased odds of having prolonged stay as compared to children with surgical conditions(For sickle cell disease: OR:11.2, 95%CI:1.3-95.1, P-value = 0.03; Malaria OR:10.7, 95%CI:1.4-82.5, P-value = 0.02; sepsis:OR:10.5, 95%CI:1.3 - 82.7, P-value = 0.03). Although, participants first seen by consultant had about 3-fold increased odds of prolonged stay as compared to children first seen by house officers, this relationship did not reach statistical significance at 95% confidence interval (Adj OR: 2.57; 95%CI: 0.90 – 7.31; P-value = 0.08). Table 3 also showed that children admitted by Consultants had the highest mean length of stay (57.9±50.8 hours) but the difference was not statistically significant (P-value = 0.8334). Also, admissions during the afternoon shift were about 1.6 times more likely to have prolonged stay as compared to morning shift admissions. This relationship was not statistically significant (P-value= 0.06). There was no statistically significant difference in the odds of having prolonged hospital stay and the age of the children. (Table 4)

Table 4: Univariable and multivariable logistic regression analysis of predictors of prolonged hospital stay in the Children Emergency Room, UCTH, Calabar.

Univariable analysis				Multivariable analysis		
Factor	**COR**	**95% CI**	**P-value**	**Adj OR**	**95%CI**	**P-value**
Age (years)						
Above 12	1.00	Ref	Ref	1.00	Ref	Ref
<1	1.47	0.47 - 4.57	0.51	1.40	0.42 - 4.70	0.59
1-5	1.42	0.48 - 4.20	0.53	1.28	0.40 - 4.08	0.68
6-12	1.23	0.38 - 3.98	0.73	1.03	0.30 - 3.47	0.96
Shift of admission (hours)						
Morning (8.00- 14.00)	1.00	Ref	Ref	1.00	Ref	Ref
Afternoon (14.00-22.00)	1.49	0.94 - 2.36	0.09	1.60	0.99 - 2.60	0.06*
Night (22.00 – 8.00)	1.08	0.58 - 2.04	0.80	1.28	0.65 - 2.50	0.47
Cadre of admitting doctor						
House officer/interns	1.00	Ref	Ref	1.00	Ref	Ref
Junior Resident	1.13	0.63 - 2.03	0.68	1.11	0.61 - 2.02	0.74
Senior Resident	1.18	0.62 - 2.23	0.62	1.21	0.62 - 2.36	0.57
Consultant	2.29	0.84 - 6.26	0.11	2.57	0.90 - 7.31	0.08*
Previous treatment before presentation						
None	1.00	Ref	Ref	1.00	Ref	Ref
Home or herbal remedy/alt	0.48	0.22 - 1.07	0.07*	0.41	0.18 - 0.95	0.04*
Health facility	0.47	0.19 - 1.18	0.11	0.39	0.15 - 1.02	0.05*
Multiple treatment	0.31	0.13 - 0.74	0.008*	0.26	0.11 - 0.65	0.004*
Discharge diagnosis						
Surgical/Others	1.00	Ref	Ref	1.00	Ref	Ref
Malaria	10.57	1.40 - 79.71	0.02*	10.67	1.38 - 82.49	0.02*
Sepsis/Meningitis	10.45	1.31 - 83.24	0.03*	10.16	1.25 - 82.71	0.03*
Respiratory pathology	7.45	0.996 - 55.75	0.05	7.58	0.99 - 58.22	0.05
Sickle cell anaemia	9.32	1.14 - 76.03	0.04*	11.23	1.32 - 95.14	0.03*
Gastrointestinalpathology	6.38	0.75 - 54.08	0.09	6.29	0.72 - 54.72	0.10
Gender						
Male	1.00	Ref	Ref			
Female	0.68	0.44 - 1.05	0.08			
Indigenous Districts in Cross River state and others						
South district	1.00	Ref	Ref			
Central district	1.46	0.75 - 2.85	0.27			
North district	1.32	0.63 - 2.79	0.46			
Akwa Ibom State	1.21	0.67 - 2.19	0.53			
Others	0.65	0.31 - 1.35	0.25			
Duration of illness before presentation						
<12	1.00	Ref	Ref			
13-24	1.06	0.45 - 2.50	0.90			
25-48	0.97	0.39 - 2.43	0.95			
49-72	1.41	0.60 - 3.32	0.43			
>72	1.62	0.78 - 3.36	0.20			

*: Statistically significant value at P-value<0.05; Multivariable Model built with: age, Shift of admission (hours), Cadre of admitting doctor, Previous treatment before presentation, and Discharge diagnosis. COR: crude odds ratio, AdjOR: Adjusted odds ratio. *statistically significant at P-value <0.05. Area under ROC curve: 0.6568

Discussion

This study sought to assess the patterns of presentations, morbidity and mortality, and the predictors of prolonged stay at CHER of the University of Calabar Teaching Hospital, Calabar Southern Nigeria from 1st January to 31st December, 2014.

Admission pattern and presentations

We found that about two-thirds of admitted children were under-fives and more males than females were admitted .This admission pattern is typical of age-related morbidity pattern in LMICs.[2,11–13,15,18,21–23,35] In comparison to older children, under-fives are more vulnerable to infectious diseases, the predominant cause of emergency admissions in Nigeria.[11,13,14]

Although early presentation can improve prognosis, only one-third of the admitted children presented early (within 24 hours of illness). From previous studies, the reasons for late presentations at paediatric emergency units includes poor identification of early sign of disease severity by care givers; exorbitant cost of hospital treatment as patient pay out of pocket, poor health seeking behaviour and beliefs in remedies with unproven efficacy.[36,37] Thus, it is not surprising that prior to their presentation, about half of the study participants had received home remedy.

Furthermore, majority (79.2%) of admitted patients came to the hospital without formal referral while a few (16.3%) were referred from CHOP of our hospital. Our finding is comparable to the study by Linden et al who reported a self-referral of 61%[38]. Only one-third of the self-referrals presented during morning shift in our study. This is similar to findings by Opunabo et al in Port Harcourt, Nigeria.[29] The high prevalence of self-referrals at our centre may be because acutely-ill children present a challenge and dilemma to the parents, who reflexly or in desperation, sought for immediate medical assistance at CHER, even at odd hours. However, studies have shown that majority of self-referrals to emergency departments (ED) are not appropriate patients for emergency units.[29,38–40]

Ideally, Nigerian health system is a tripartite structure comprising of primary, secondary and tertiary healthcare facilities with intercalated referral pathway.[41] Though emergency cases has no restricted access to the ED, the high numbers of self-referrals and referrals from CHOP highlights the non-coordinated interaction between the three levels of care. Hence a tertiary care facility like ours, which is supposed to concentrate on managing critical and complex cases, is being overburdened. Research had identified three factors that can lead to overcrowding of ED as: input factors, throughput factors and output factors.[27–29] Primary and secondary health care facilities should be strengthened in order to reduce self-referral to tertiary centres in the Country. We urge the implementation of Universal Health Coverage to improve patients and families' access to early care

Our study revealed that comparable proportion (43.8%) of children were admitted during the morning shift as compared to a report of 52% by Bashkin et al in Israel[27] Majority of mothers in Calabar metropolis are either civil servants or self-employed and may only notice the acute symptoms in their children after close of business. Hence three-fifth of emergency cases presented at off-hour. Such patterns of presentation suggest the need for the availability of more senior medical staff during off-hours in CHER.

Similar to previous studies from LMICs, the common diagnoses in this study (respiratory tract infections (53.7%), malaria (52.4%), septicaemia (14.3%) and complications of SCA (8.5%)) were preventable illnesses.[8,10–12] Therefore, public health campaign on prevention and treatment of common infectious diseases and premarital counselling against SCA should be intensified. Compared with reports of previous authors in the same centre, the trends in the prevalence of meningitis increased from 0.7% in 1988 (42) to 2.7% in 2012[22] and then 10.3% in this present study. The current prevalence of meningitis at our centre is also higher than reports of 2.2% and 5% from Asaba[24] and Umuahia[13] respectively in Southern Nigeria. The reason for this increased meningitis trend is not readily apparent but overcrowding with poor ventilation due to increased urban migration and the impact of global warming and desertification may be contributory.[43] Although our region (Southern Nigeria) lies outside the traditional meningitis belt, this pattern may suggest an impending regional epidemic. A further public health research on prevalence of meningitis is warranted. We also suggest that mass administration of cerebrospinal meningitis vaccination should be considered in this region.

Predictors of hospital stay

Bench marked by our unit's policy of maximum stay of 72 hours, about 16% of the children had prolonged hospital stay (PHS). Although Bekmezian et al[28] also reported a similar rate of prolonged stay of 13% , their cut off was shorter (>8 hours). We hypothesize that earlier discharge of majority of participants were in part due to early review of most patients within 15 minutes of arrival at the CHER. Timely review by the unit Consultant and other appropriate Paediatric subspecialties might have also contributed to the relatively low rate of prolonged hospital stay in our centre. In addition, about two-thirds of the patients received intervention within 30 minutes of arrival at CHER.

We found from multivariable analysis, that the diagnosis (in descending order of SCA, malaria, sepsis/meningitis and respiratory illness), had higher odds of prolonged hospital stay as compared to surgical cases. This suggests that prevention and prompt management of infectious diseases can reduce overcrowding of CHER in our environment. Since patients' relations pay out of pocket for the care of their wards, parents of children presenting with the aforementioned diagnosis should be counselled early about the possibility of prolonged stay. Kuti at al proposed that such counselling can reduce frustration, engender confidence by guardians and prevent the risk of discharging against medical advice.[44] Indeed, public health intervention to prevent sickle cell anaemia is of essence. Furthermore, parents of children with sickle cell anaemia should be counselled on how to prevent and manage complications of the disease. Routine early haemoglobin genotyping should be encouraged as most parents usually do not know the genotype of their children prior to being admitted for complications of sickle cell anaemia.

We found that children that had alternative care before presentation had the longest mean hospital stay which is more than doubled the mean hospital stay of those children that had no prior treatment (216.0±0.0 Vs 78.5±81.5). It is therefore imperative that mothers should be counselled on appropriate home treatment for common ailments. We expected that there may be worsening prognosis if mothers delay in bringing their children to the hospital. Surprisingly, children that had prior multiple treatments, or that visited another health facility before presentation had 59%, and 61% lesser chance of staying beyond 72 hours as compared to children that did not. However, this pattern may suggest that such children had appropriate treatment at those primary or secondary facilities. Appropriate counselling would have prevented their further presentation at a tertiary centre as ours. Nonetheless, our finding may also suggest that the lower level medical centres referred the children promptly for acute care at our centre, (possibly because of lack of personnel and infrastructure at their health facility.[4] Aggressive care of such referred cases may lead to early recovery of the children. Similarly, Bekmezian at al found that children that were promptly transferred to Intensive Care Units and those that had pulse oximeter in an ED were discharged early.[28] Perhaps, the children had effective and appropriate home remedy or institutional care but the mothers still sought help at our centre because of anxiety. Studies have shown that children that arrived at emergency departments during off hours may stay longer.[12,23,28,45] This is because highly skilled personnel and some investigations may not be available at such period of the day. However, our study revealed that there was no statistically significant difference in the length of stay of the children based on the period of admission. Thus, the usual slowdown of services during off hour appeared not to have affected hospital stay at our centre. Although, infants are usually more vulnerable to infectious diseases as compared to older children,[11] we found that there was no statistically significant difference in the odds of prolonged stay and the age of our study participants. This may be related to the high vaccination rate (99.1%) among our cohort of participants, which improved the prognosis of common infectious diseases among the infants.

It was expected that the cadre of admitting medical staff should affect the length of hospital stay of the children. Although our results from the Analysis of Variance and multivariable analysis suggest that there may be an increasing length of stay with increasing length of experience of admitting staff, this relationship was not statistically significant. This pattern might be because consultants preferentially see the very ill children (that may eventually stay longer,) based on the triage protocol of the unit.

Similar studies from other climes showed that varying predictors impact hospital stay, suggesting that the socioeconomic and health system milieu of each region may play significant roles. For example, Chaou et al[30] and Chung-Hsien et al[31] in Chang Gung, Taiwan found in contrast to our study that increased age, day-shift or weekend arrival,

and gender had statistically significant impact on stay at paediatric EDs. The risk factors that we studied may be different from what was considered by previous studies from other regions because of differences in organisation of health systems. For example, Wiler et al[32] in USA, studied the impact of ambulance diversion on hospital stay which was not considered by us while in a paediatric ED, Li et al[33] found that delayed hospitalization greater than 16 hours had the longest LOS.

Hospital interventions and outcomes

More than two-thirds (67.9%) of the patients received intervention within 30 minutes of arrival. This is a desirable service delivery indicator as a timely delivery of emergency care services can build confidence in care givers and improve patients' outcome.[46] The consensus document of the society for Academic Emergency Medicine recommended morbidity specific time to intervention ranging from <10 minutes to 6 hours. This study finding falls well within this irrespective of pathology.[47]

At discharge, majority of the children received antibiotics that were mostly commenced empirically, as only 22% of antibiotic administration was guided by blood culture results. This calls for development of protocol on judicious prescription of antibiotics to avoid community acquired antibiotic resistance. Our study revealed that, 4.8% (n=40) of the total admissions were transfused on account of severe malaria (n=31; 77.5%) and SCA (n=9; 22%). Our finding is similar to an earlier study from our environment[42] in which severe malaria and SCA were the major indications for blood transfusion. However, the transfusion rate in this study was lower than the transfusion rate in 1988 (4.8% Vs 11.2%).[42] The lower blood transfusion rate may be due to the wide spread use of Artemisinin combination therapies (ACT), coupled with the use of Long Lasting Insecticide treated bed net (LLITN) and better in-hospital and follow-up management of SCA. Recognising the multiple complications of blood transfusions, we suggest that efforts at further reducing the current transfusion rates should focus on counselling mothers on prevention of severe malaria and complications of SCA.

The proportion of properly disposed children in this study was slightly higher than what was obtained in 2012(82.8% Vs 71.8%).[22] This might partly suggest that there was an overall improved care at the unit. Furthermore, there has been a progressive decline in mortality rate at our centre from 5% in 1988(42) to 2% in 2012[22] and 0.5% in this present study, that was conducted in 2014. This decreasing trend may further suggest an improvement in the overall care offered at the centre. A dedicated paediatric consultant at the unit, coupled with a review of the triage system (the first on call has been changed from a house officer to a junior resident), and the weekly clinical audit meeting could have contributed to the downward mortality trend. In contrast; many CHER in Nigeria had higher mortality rates (2-17.5%). During similar study period.[2,11,12,15,18,21–23]

A review of the clinical course of the children that died showed that they had preventable conditions. They presented later than two weeks after onset of illness and died within 48 hours of admission before resuscitative measures could impact on their prognosis. Unfortunately, autopsy which could have improved our practice and knowledge of the conditions was not done despite counselling because of poor perception and cultural believes of the parents.

Limitation of the study

This is an institutional based cross sectional study and we may not be able to be certain about causality in the associations demonstrated. More so, there may be other residual confounding variables that might not have been considered. Nevertheless, we still believe that this pioneer study has contributed invaluable evidence to improving the operations of paediatric emergency care in Nigeria and sub Saharan Africa. The principal investigator randomly cross checked the data extraction of the resident doctors by comparing the records in the proforma with the clinical case files of the participants and did not observe any significant error. However, since the information extracted are fixed figures that do not require the opinion or judgement of the extractor, we did not calculate the inter-rater score.[48]

Conclusion

Only about 16.4% of our participants had prolonged hospital stay beyond 72hours. Children with common infectious diseases (such as Malaria and sepsis/meningitis) and haemoglobinopathies (SCA) had higher risk of prolonged hospital stay beyond 72 hours. Furthermore, children who had alternative herbal remedy before presentation had the highest hospital stay Thus, Public enlightenment campaign to prevent complications of com-

mon infectious conditions such as malaria, sepsis and meningitis and haemoglobinopathies is very important. Inappropriate pre-hospital treatments should also be discouraged. Our study highlighted that majority of patients were self-referrals and presented at off hours. This calls for health system strengthening of the primary and secondary healthcare facility of Nigeria to reduce overcrowding of the tertiary care centre like the site of the present study. We urge the implementation of Universal Health Coverage to improve patients and families' access to early care and adoption of high level manpower as first line doctor in CHER as this will assure quality services and positively impact patient's outcomes. In addition, government effort should be geared towards training more Paediatric Emergency specialist, and provisions of essential hospital infrastructures to further reduce morbidity and mortality.

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Declaration of conflict of interest

The authors declare no conflict of interest that requires disclosure.

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