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ORIGINAL ARTICLE

Pattern of admissions and outcome in the children emergency department of a tertiary health institution in Southwestern Nigeria: A four-year review

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ABSTRACT

Introduction: Pediatrics and adolescents are susceptible to illnesses that often necessitate emergency attention. Morbidity and mortality from illnesses in these ages have attracted much interest globally, particularly in Africa. Knowledge of pattern and outcomes of admissions may guide policy and interventions especially in resource constrained settings. The study aimed to determine the pattern of admissions, outcomes and seasonal variations of conditions that presented at the children emergency of a tertiary health institution over a four-year period.

Methods: A retrospective descriptive study of children emergency admissions from January 2016 to December 2019. Information obtained included age, diagnosis, month and year of admission, and outcome. Descriptive statistics were used to describe the demographic characteristics and Chi-squared test to assess their associations with the diagnoses made.

Results: There were 3,223 admissions. There were more males (1866; 57.9%) and more toddlers (1181; 36.6%). The highest number of admissions were observed in the year 2018 (951; 29.6%) and during the wet season (1962; 60.9%). There was an overall mortality rate of 7%; complicated malaria, gastroenteritis and meningitis were the leading causes of death. Malaria ($\chi 2 = 135.522$, p value < 0.001), and gastroenteritis ($\chi 2 = 130.883$, p value < 0.001) were predominant among the toddlers while sepsis ($\chi 2 = 71.530$, p value < 0.001) and pneumonia ($\chi 2 = 133.739$, p value < 0.001) were more among the infants. Typhoid enteritis ($\chi 2 = 26.629$, p value < 0.001) and HIV ($\chi 2 = 16.419$, p value $= 0.012$) were commoner among the early adolescents.

Conclusion: The major causes of death in the study area are preventable with more of these amongst the children under the age of 5 years. There are seasonal and age-related patterns to admissions and the need for policy formulations and emergency preparations to be tailored towards these observed patterns through the year

Introduction

Children are often prone to acute illnesses and diseases which often necessitate emergent attention. A child has been described as someone under the age of 18 years while young people comprise of individuals within the age group of 10 and 24 years [1,2]. Most of the aforementioned age-groups are attended to at the children emergency department when the need arises. Childhood deaths especially in under 5 years results from complicated malaria, pneumonia and diarrhea; these often require emergency attention for survival [1,3,4]. Adolescents and young people are prone to non-communicable diseases and injuries which also require emergency services for their survival [5–7] When children, adolescents and young people present early for emergency care, mortality rate from preventable diseases reduce [8].

An emergency department is usually the gateway to the hospital where the initial assessment and management is given to patient [9]. In some settings, this usually involves separate adult and children units. Studies have reported that in a resource poor clime like Nigeria, most emergency departments have paucity of equipment and low manpower to facilitate adequate delivery of healthcare at this all important section of the hospital [10,11]. In some sub-Saharan African countries, the provision of a standard emergency department has been reported to be

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a challenge because of poor political will of various government [8]. In spite of these challenges, there continues to be presentations from these ages with different disease conditions at emergency department of hospitals. Many lives have been saved at the children's emergency department in spite of the paucity of manpower and adequate equipment. For example, in one of such resource poor area about 88% of patients who presented in the emergency department survived and recovered from cerebral malaria [12]. The success of care at the Children Emergency Department (CED) would be influenced by the preparedness and availability of essential drugs and equipment, amongst other factors. In resource-poor settings where there is a paucity of funds, judicious use of the little available funds may be guided by the pattern of admissions into the CED.

This study was done to elucidate the pattern and outcome of emergency admissions at children emergency ward (CEW) of the Ekiti State University Teaching Hospital (EKSUTH), Ado Ekiti. It also contributed to the epidemiological database for further studies on medical conditions that present at the emergency units while helping to allocate scarce resources towards these conditions. Therefore, the objectives of the study were to ascertain the age-specific disease conditions, yearly distribution, diagnoses and the outcomes of admissions of patients over a study period of four years.

Materials and methods

Study design and settings

A retrospective descriptive study of patients admitted to the CEW between January 1st, 2016 and December 31st, 2019 was conducted at Ekiti State University Teaching Hospital (EKSUTH), Ado-Ekiti, a state owned institution, in the Southwest Nigeria which is a 300-bedded hospital [13]. Ado Ekiti has an area of 6,353.0 per square Km and has a population of 3,270,798 [14]. The CEW is separate from the adult accident and emergency unit and has 12 beds. The CEW conventionally provides medical and surgical emergency services to children within the ages of 1 month to 18years from the community and also serves as a referral center for 3 specialist hospitals, 18 secondary health facilities and over 150 primary health care facilities owned by the Ekiti State Government. The CEW is run by pediatrics interns, resident doctors and consultants. It operates around the clock with supporting nursing staff, and other workers such as health attendants, porters, cleaners and health records staff. As at the time of this study, there were no pediatric emergency medicine specialists. However, there were 25 staffs which include three consultant pediatricians, three pediatric resident doctors, two house officers and seventeen nurses with attendant support staff on duty.

On presentation at the CEW, patients are triaged and resuscitated by the staff on duty. Generally, the hospital does not offer free medical services as most of our patients pay out of pocket for their health care services except the very few who were enrolled on the National Health Insurance scheme [15]. Consultations and review by other subspecialties were sought when necessary. Patients usually get transferred to the main children's ward whenever they were clinically stable, usually 24 hours after resuscitation. Some patients may be discharged home from the CEW. Most of the others were moved to the main children ward where respective specialists attended to their health needs. However, two patients were transferred to mental ward at the Psychiatrist's instance and High Dependency Unit (HDU) for a psychiatric disorder and severe head injury respectively.

Study population: This comprised all patients who were registered and admitted to the CEW during the period under review. Patients who were brought in dead (B.I.D) were excluded.

Data collection and case definition

Data were extracted from the admission and discharge records. The records of the patients were analyzed to ascertain the correctness of the diagnosis in the record book before these were entered into an electronic spreadsheet. Information retrieved included the age, sex, date of admission, diagnosis and outcome of the admission. Diagnosis was based on the use of the standard clinical and laboratory criteria. The records of patients analyzed included those who were discharged, left against medical advice (LAMA), referred to other health facility and who died while still on admission. Others were those taken to the theatre and transferred to the wards for continuation of management. All medical diagnoses were categorized using ICD-10 coding system. Data collected were crosschecked and cleaned by the principal investigator and one of the authors who is a pediatrician that also participated in the management of some of the patients.

The patients were grouped as infants (1 – <12months), toddlers (1 – 3years), pre-school age (4 – <6years), preadolescents (6 – <10years), early adolescents (10 – 13years), middle adolescents (14 – 16years) and late adolescents (17–19years) [16,17] The months of April to September were classified as the wet season while the months of October to March were classified as the dry season according to the seasons of the region [18,19].

Data entry and analysis: Data were initially entered into Microsoft excel spreadsheet then, exported into SPSS Version 25.0 (Inc, Chicago, 11, USA) for analysis. The names of the patients and diagnosis were masked for data anonymization. The names were masked by replacing them with initials while each diagnosis was represented by an alphabet with appropriate coding of diagnosis done by the researcher. Continuous, normally distributed variables were expressed as mean ± standard deviation (SD) while continuous skewed variables were expressed as median (interquartile range (IQR)). Categorical variables were expressed as frequency and percentages. Comparison of categorical data was performed using Pearson's chi-square test and p-value$\leq$0.05 was considered statistically significant. Missing data were excluded from the analyses of the respective variables.

Research quality

The present study complies with the reporting quality, formatting, and reproducibility guidelines set forth by the EQUATOR network. Applicable EQUATOR network (https://www.equator.network.org) reporting guidelines were followed.

Ethical considerations: This study protocol was reviewed and approval for this study was granted by the ethics and research committee of EKSUTH with approval reference number EKSUTH/A67/2021/05/14. Information obtained for each patient was kept anonymous and confidential.

Results

There were 3223 admissions. There were 14 missing entries for age, 34 missing entries for duration of hospital stay and 8 missing entries for dates. The demographics are displayed in Table 1.

The median age and mean age were 2.5 (IQR; 1 - 7) and 4.47 ± 4.45 years respectively. Most of them were males (1866; 57.9%) and majority were toddlers (1181; 36.6%). Adolescents accounted for a little less than 20% of the admissions. There were 7 (0.2%) late adolescents erroneously admitted at the CEW because they were small-statured, unconscious and there were no relatives to provide accurate information at the time The number of patients admitted during the wet season (1673; 52%) was (1.1 times) times the number of admissions during the dry season (1542; 48%).

Monthly admissions for years 2016–2019

The peak periods of admission were observed in August 2017 and February 2018. The lowest number of patients was admitted in June 2016 and May 2018 (Fig. 1).

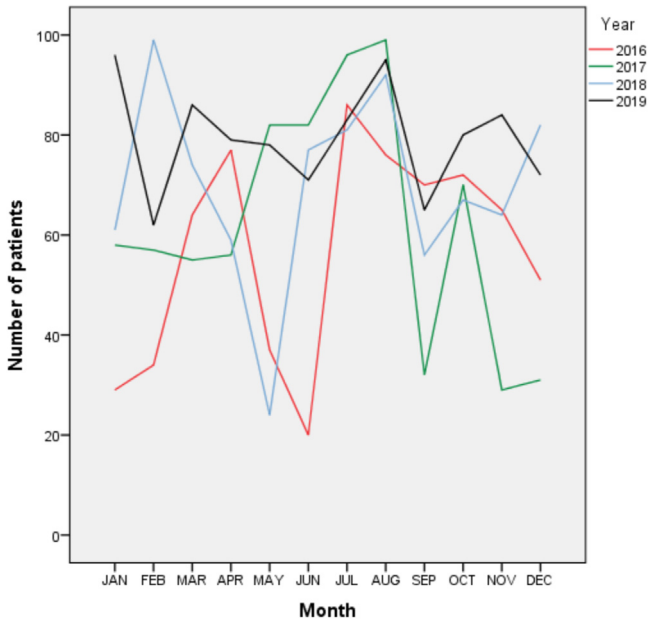

Fig. 1. Monthly admissions for years 2016 to 2019
The reductions in the months of June, September and May of 2016, 2017 and 2018 respectively coincided with industrial disputes by health workers.

Table 1
Demographic characteristics of patients seen at the children emergency unit.

Age Group	Frequency	Percent
Infants (1 month to < 1 year)	666	20.8
Toddlers (1 year to 3 years)	1181	36.8
Preschool (>3 years to < 6 years)	357	11.1
School age (6 years to less than 10 years)	434	13.5
Early Adolescence (10 years to < 14 years)	378	11.9
Middle Adolescence (14 years to 16 years)	186	5.8
Late Adolescence (17 years to 19 years)	7	.2
Total	3209	100.0
Gender		
Female	1357	42.1
Male	1866	57.9
Total	3223	100.0
Seasonal Variation		
Dry	1542	48
Wet	1673	52
Total	3215	100.0

Relationship between the age group and patients' diagnoses

A total of 2, 813 (87.4%) were medical cases while 407 (12.6%) were surgical cases. The peak presentation for HBSS and fractures was in the school-age group. Malaria, gastroenteritis, burns, tonsillitis, upper respiratory tract infections and meningitis were most common among the toddlers. Typhoid enteritis was most common among the early ado-

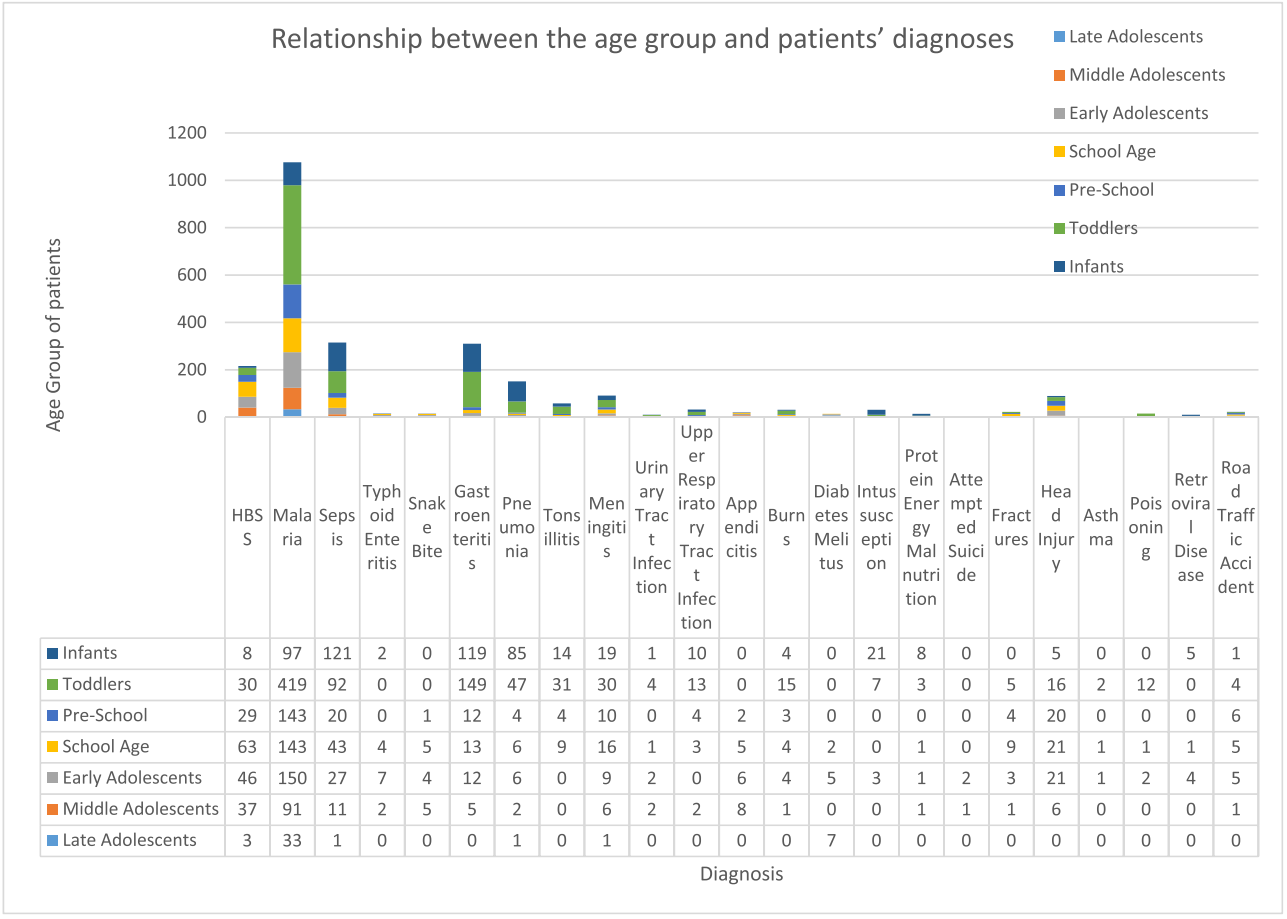

Fig. 2. Relationship between the age group and patients' diagnoses
*Infants- 1 month to <12 months; Toddlers – 1 year to 3 years; Preschool – 4 years to < 6 years; School age – 6 years to < 10 years; Early Adolescents – 10 to 13 tears; Middle Adolescents 14 to 16 years; Late Adolescents 17 to 19 years.

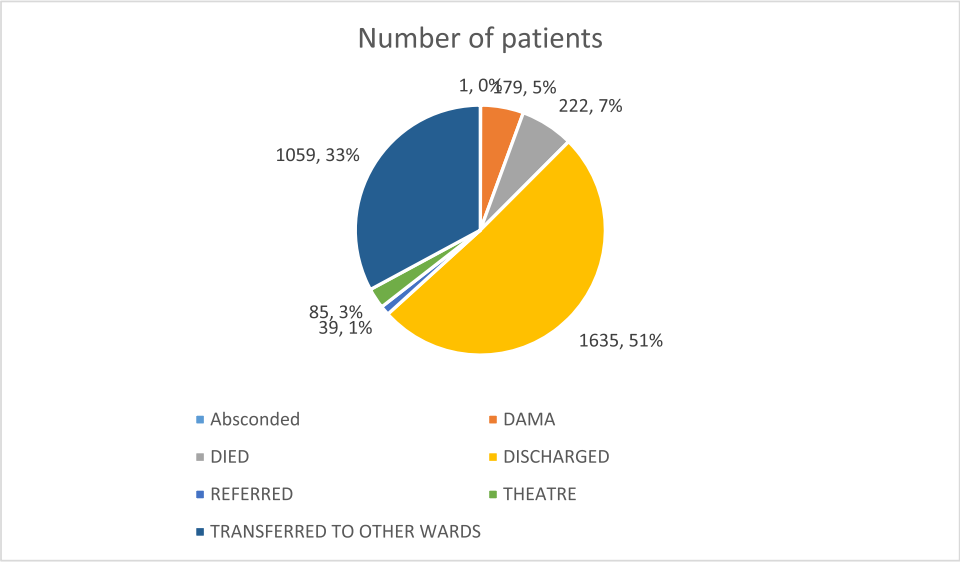

Fig. 3. Admission outcomes at CEW.

lescents. Pneumonia, protein energy malnutrition and intussusception among the infants. Head injury was commonly presented among the school aged and early adolescent age group. The following medical conditions; Malaria, Hemoglobin SS (HBSS) disease, sepsis, gastroenteritis, tonsillitis, acute appendicitis, diabetes, head injury, road traffic accident, fracture, typhoid enteritis, pneumonia, Human Immunodeficiency Virus (HIV), intussusception, snake bite, protein energy malnutrition and attempted suicide were significantly associated with age group (p value< 0.05). The commonest reason for admission was malaria and 61% (659/1076) of the total malaria cases were amongst the under-five.

Admission outcomes at CEW

In Fig. 3, 1,625 (51%) of patients seen were discharged from the CEW. While 1,059 (33%) of the patients that presented at the CEW were moved to other wards, 222 (7 %) died and 79 (5%) left against medical advice. Among those moved to other wards, one was taken to the mental health ward for continuation of management for a mental disorder and the other was moved to the high dependency unit (HDU) because of the severity of head injury sustained.

Causes of deaths

A total of 222 patients died accounting for 7% mortality rate. Malaria constituted the highest cause of death accounting for 61(33%) followed by sepsis 49 (27%) and then meningitis 18 (10%). HBSS, gastroenteritis, pneumonia and head injury all accounted for 10 (5%) each as shown in the Figure below. Among the 61 patients that died from malaria-related events, 32 had cerebral malaria while 22 of them had severe anemia (Fig. 4).

Seasonal variations of common ailments

The seasonal variation of the medical conditions is depicted by the Fig. 5 below. Most of the medical conditions were seen during the wet season as shown in Fig. 5. On the other hand, gastroenteritis, tonsillitis and intussusception were commonly seen during the dry season.

Discussion

This study assessed the pattern, outcome and seasonal variations of admissions at the Children Emergency Ward (CEW) of a tertiary institution in south western Nigeria. In this study, more males were seen at the Child Emergency Department (CED). This finding is similar to previous report in a study done at Calabar by Enyuma et al. [3]. The reason for male preponderance in the presentation at emergency department may be attributed to the cultural relevance and gender inequality in favor of males in sub–Saharan Africa. Gender inequalities in health and education have been reported in some sub-Saharan African countries with slow progress seen in bridging this gap [20–23] These inequalities might have been in force from childhood thus affecting the impact on health seeking behaviors of their parents and care givers.

More toddlers were observed at the CEW in the years under review when compared to the other age groups. Enyuma et al also observed a similar high number of this age group of patients in their study [3]. That more toddlers than other age groups presented in the children ED may be due to their adventurous tendencies; because they are at the age of exploring their environment [24]. Also, many of them are put in the Crèche for care during the parents' engagement at work. The negative impact of Crèches on toddlers have been reported [25]. In this study, there were more toddlers with medical conditions than surgical ones. However, there are other studies that reported that toddlers present almost equal proportion of both surgical and medical cases at the emergency department when compared with other age groups [24,26,27].

More patients presented at the CEW during the wet season of (April to September). This is because more infectious diseases are commonly prevalent during the wet rainy season in Nigeria. In this study, the three conditions that were found to be commonly presented at the CEW during the wet season were malaria, sepsis and sickle cell anemia in that order. In addition to seasonal commonality, the association between severity of malaria and HBSS has been reported in patients [28]. The increased prevalence of malaria during the wet season may be attributed to the presence of environmental findings like puddles and bushy areas which support the thriving of the vector for malaria transmission. In addition, cold weather has been reported to contribute to increased occurrence of HBSS crisis [29]. That we observed a higher incidence of snakebite during the wet season was probably because of increased farming activity and availability of grown grasses that serve as hiding places for snakes. The increased rainfall during the wet season encourages growth of bushes and trees which are good harbors for snakes. This may explain why snake bite is commoner during this season. Also, burns injury were more common in wet season which might be attributed to the possibility of most scald injuries occurring during this season because mothers often want to boil water for bathing their children. Previous studies have

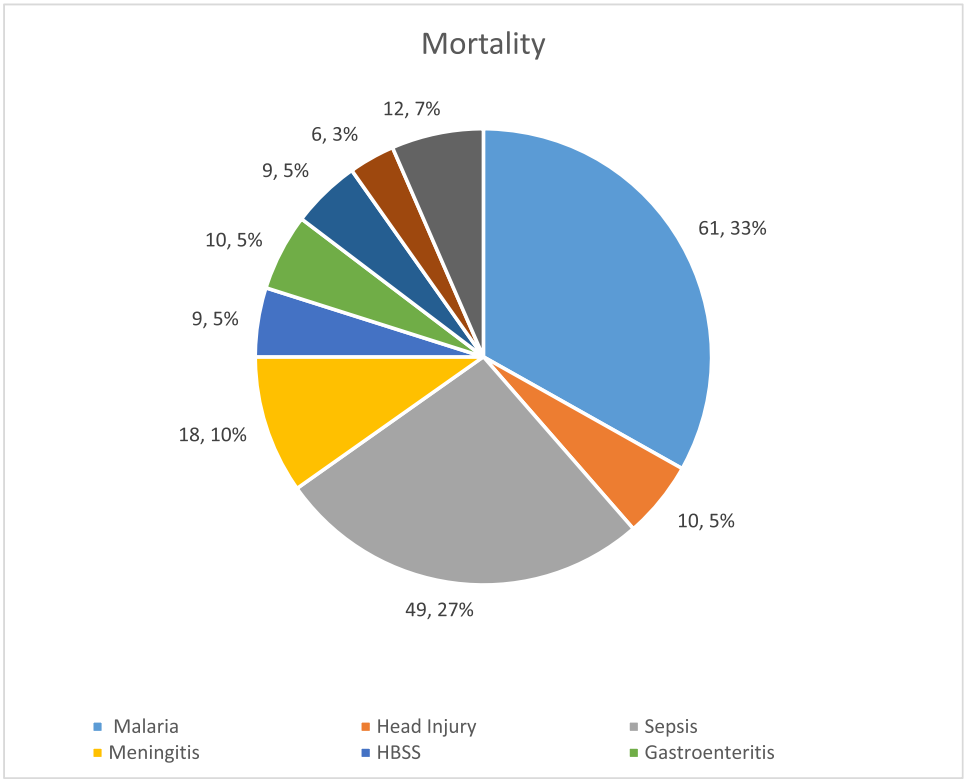

Fig. 4. Causes of death.

also reported higher incidence of burns injury during the cold season [30,31].

Though the vector for malaria transmission, Anopheles mosquitoes, breed more during the rainy season, it has however been reported that interrupted use of Insecticide Treated Nets (ITNs) which often occur during the dry, hot season may contribute to increased prevalence of malaria infestation during the dry season [32] Gastroenteritis and sepsis in addition to malaria were the three common medical conditions observed during the dry seasons. Malaria occur throughout the year and it is the commonest observed medical condition at the accident and emergency unit [32,33]. There are many reasons that have been attributed to the severity of malaria in children, preadolescents, and adolescents ages. This include the presence of homogenous hemoglobin genotype [25,34] and the endemicity of malaria in the area of study.

The scarcity of potable water supply which is prevalent during the dry season may be a contributory factor to the high occurrence of gastroenteritis in year under review [35].

In this study, there are medical conditions that were commonly observed to be particularly seen at a certain age group. While HBSS and fractures were seen more in school age group, burns, malaria, and other infectious diseases were commonly seen among the toddlers. The reason HBSS was commonly presented in school age group may be related to the excessive, uncontrolled exercise in school, long walk to school and inadequate, poorly supervised water intake among them during school hours. Their getting involved in dangerous activities as they enter school may be related to why fractures were prevalent in this age group. Among the adolescents, typhoid enteritis was more common. Older children have the independence to buy street food of their liking and this may pose a risk as consumption of contaminated food and water is known to favour transmission of the disease.[36] Pneumonia, protein energy malnutrition (PEM) and intussusception were more common among the infants. While the peak age of presentation for intussusception and PEM is in this age group [37–39] children of this age group are prone to reduced immunity because of certain peculiarities. This includes their relative maturity in their immune status, poor weaning practices with attendant risk of food contamination that can potential result in some infectious and malnutrition related diseases. In addition to these, most of the medical conditions have been reported to be common in the age of presentations as seen in this study [4,37,40–43].

There were reductions in the number of patients seen in the months of June, September and May of 2016, 2017 and 2018 respectively, which coincided with industrial disputes between the health workers and the government thus leading to complete or partial withdrawal of services. It has been reported that strike action and industrial disharmony involving health workers have a negative effect on service delivery to patients in Nigeria [44].

The percentage mortality of 7 % in this study is similar to Duru et al's [40] report of 7.6% mortality in Bayelsa State. This similarity in mortality rate could be a reflection of the state of the health sector in the country. Duru et al [40] also reported that malaria and septicemia were among the major causes of mortality which is like the findings in this study. These medical conditions were major causes of mortality in these two areas in spite of the studies being from different geographical location of the country. This could be a pointer to policy makers in the health sector about where to invest more to guarantee the survival of children under the age of 18 years in Nigeria. It is possible that late presentation at the hospital which may result from use of uncertified herbal concoction and visiting inappropriate centers for care contributed to the high mortality rate observed in this study and thus the need to intensify measures at prevention of most of these childhood killer diseases and need to educate parents and caregiver on importance of presenting their sick children and wards early at health facility as earlier suggested [45]

About 5% of patients seen in the years under review left against medical advice (LAMA). This finding is higher than less than 1% reported in a cross sectional study from Saudi Arabia [46] but comparable to 4.1% reported from Ogbomosho [47] and 4.9% from a previous study conducted in our hospital [48]. Perhaps the advancement in the health care indices in Saudi Arabia might be responsible for the low prevalence in that country compared to the current study and the one from Ogbo-

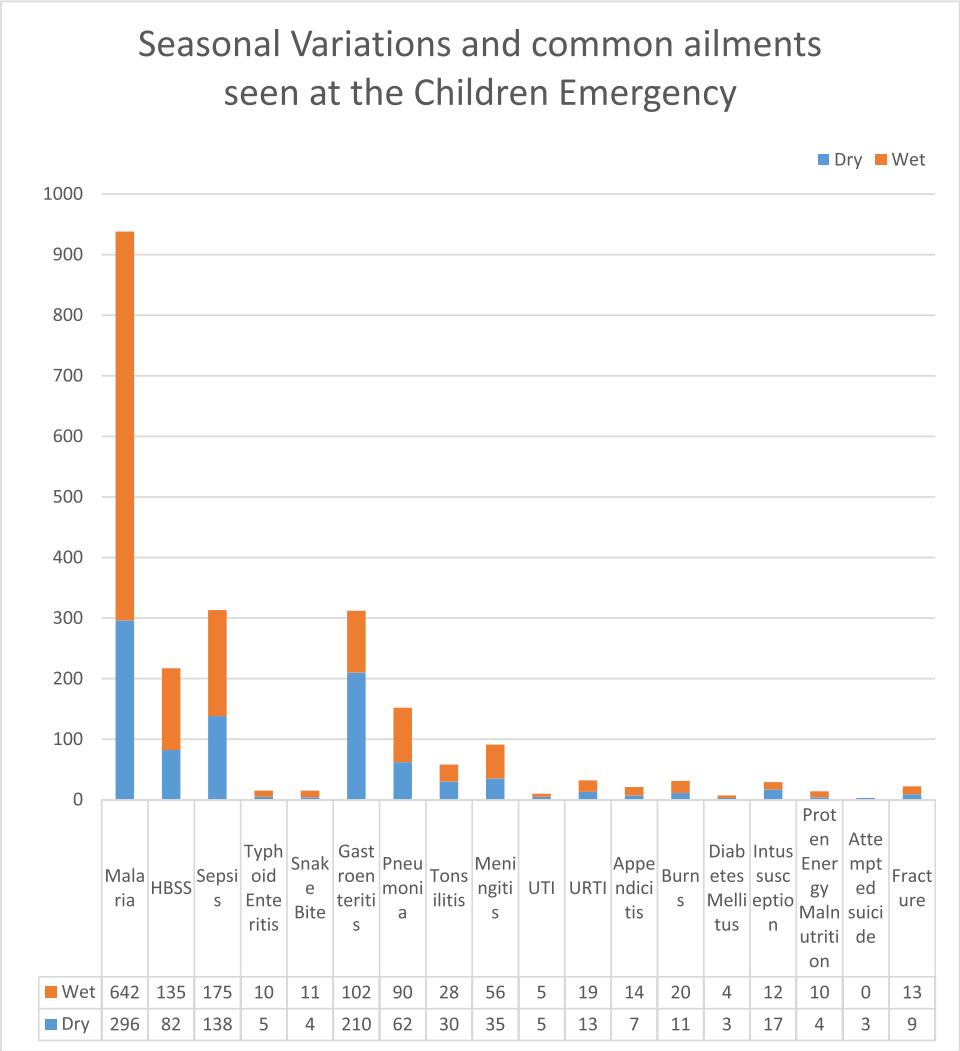

Fig. 5. Seasonal variations of common ailments.

mosho. Furthermore, the difference in the health care financing methods between Nigeria and Saudi Arabia may also account for the disparity in the rate of LAMA where the method of payment for health care services is through out of pocket in the former and through insurance scheme which lightens the burden of health care financing on the patient and care givers [15].

As a retrospective study, the inability to retrieve information on timing of patients' presentation at the hospital is a limitation. Another limitation is the lack of information on the pathological diagnosis. Also, there were some missing data as the hospital does not operate electronic medical records.

Conclusion

There were medical conditions that were commonly seen in certain age groups. Malaria and gastroenteritis were predominant among the toddlers while sepsis and pneumonia were more among the infants. Typhoid enteritis and HIV were commoner among the early adolescent age group. This could help government and other stakeholders to address how to prevent the morbidity and mortality from these ailments. Also, seasonal variations were observed in the pattern of admissions at the CEW. This could be a focal point for the management of the hospital on which areas to invest more during each season. Majority of the causes of death in the CEW can be prevented if the enabling environment and policy implementation are given top priority by the government.

Dissemination of findings

Findings of this study will be presented at the Paediatric departmental meeting and to the management of the hospital where the study was conducted. Also, results of the study will be presented to relevant stakeholders involved in policy formulation and resources allocation in the state where the study was conducted

Authors' contributions

Authors contributed as follow to the conception or design of the work; the acquisition, analysis, or interpretation of data for the work; and drafting the work or revising it critically for important intellectual content: ATA and OAF contributed 15% each, AOB contributed 10% and AI, FOA, EOO, ATA, FE, TO, BO, and OSO contributed 7.5% each. All authors approved the version to be published and agreed to be accountable for all aspects of the work.

Declaration of Competing Interest

The authors declare no conflict of interest

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