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Morbidity pattern and outcome among under-fives at the children's emergency room of Federal Medical Center Umuahia

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Abstract*: Background:* The patterns and outcome of under-five morbidity in health care facilities are invaluable tools that reflect the disease burden and health care needs of the children in the community. Efforts are being made over the past few years to improve child care services in our centre. A preliminary report therefore will assist in goal-targeted intervention strategies and serve as a baseline for subsequent reviews.
Aim: To evaluate the morbidity pattern and outcome of under-fives at the Children's Emergency Room of the Federal Medical Centre (FMC) Umuahia.
Subjects and methods: A retrospective review of post-neonatal children aged 1 to 59 months seen over a period of five years. Information such as age, gender, month of admission, diagnosis and outcome were analyzed.
Results: Of the 5,884 under-fives admitted over the study period, 56% were males with a male to female ratio of 1.2:1. The month with highest admissions was January. The leading causes of morbidity were malaria, diarrheal diseases and respiratory tract infections accounting for 79.9%. Sepsis was the most common morbidity noted among infants ($p< 0.001$). Mortality rate was 4%. Death rate among infants was significantly higher than in those beyond infancy, $p < 0.001$.
Conclusion: Preventable infections are the leading causes of post -neonatal under-five morbidity in Federal Medical Centre Umuahia.

Key words: Pattern, Morbidity, Outcome, Under-fives, Nigeria

Introduction

The under-fives are the most vulnerable pediatric age group that bears the significant burden of disease in childhood.[1] Growth faltering and subsequent mortality in childhood are the cumulative consequences of multiple disease processes encountered by this group of children.[2] The pattern of disease presentations differs among communities, and knowledge of this helps to identify the prevailing health needs of such communities. Likewise the pattern of admissions in a health care facility may reflect the disease burden of the community which it serves.

The burning desire of pediatricians to improve child survival can only be more effective if interventions are based on reasonably accurate information about the trends of diseases in the locale where they work.
Several studies on the pattern of diseases in children done in many centers in Nigeria identified infectious, communicable and vaccine-preventable diseases as major causes of childhood morbidity. [3-9] However, no such study has been carried out in this tertiary health facility. The Children's Emergency Room in our institution was established as a unit in 2009. There have been considerable efforts over the past five years to improve child care services in our hospital through manpower and provision of modern equipment. However the import of such services may not be properly ascertained without a reference baseline data. A preliminary documentation of the pattern and outcome of admissions in our Children's Emergency Room prior to such improvements will serve as a reference guide in evaluating the impact of these services, set priorities for goal-targeted healthcare intervention strategies and inform decisions on resource allocation.

The study therefore is a first attempt to document the morbidity pattern and outcome among under-five children seen in the Children's Emergency Room of Federal Medical Centre Umuahia. This will not only help in evaluating and improving the existing facilities but also serves as a baseline data for future re-assessment in our center.

Subjects and methods

Study site

FMC Umuahia is one of the two multispecialty tertiary health facilities in Umuahia, the capital city of Abia State in Nigeria. The centre was so designated in November 1991 having metamorphosed from the former Queen Elizabeth Hospital commissioned in March 1956. Umuahia is in the rain forest region of Nigeria with wet and dry seasons. The wet season includes the months of April through October while the dry season spans from November to March.[10] The hospital serves a population of about 2,845,380 in Abia State (2006 census),[11] and also provides health services to the adjoining communities of boundary states like Imo and Akwa Ibom States. The Pediatrics department runs clinical services in its out-patient and in-patient facilities. These include the Children's Out-Patient clinic for general and specialist consultations, the Newborn Special Care Unit, the Paediatric General Ward for post-neonatal admissions, and the Children's Emergency Room (CHER) where critical cases are stabilized before they are transferred to the Paediatric General ward. CHER has 17 bed spaces subdivided into the General room, Diarrhea Treatment Unit (DTU) and the Isolation room. CHER is open 24 hours daily all the year round and receives children aged 1month - 17years with emergency conditions. It has an average patient attendance of 2250 per annum and is manned by Consultant Pediatricians, Pediatric Resident Doctors, House Officers and trained nursing staff. Patients spend an average of 48 hours before they are transferred to the ward or discharged. As part of the efforts to improve child care services, CHER has such equipment as suction machines (manual and electric), nebulizers, glucometers, a multi-parameter monitor, a side laboratory with haematocrit centriguge and reader and a microscope. Other facilities include piped oxygen and air, standby oxygen cylinder, an X Ray unit stationed in the Accident and Emergency complex where CHER is located.

Study design

A retrospective review of all post-neonatal patients aged 1 to 59 months attended to in the CHER of FMC Umuahia over a five year period (from January 2009 to December 2013). The case notes of these patients were retrieved after ethical approval (FMC/QEH/G.596/ Vol.10/320) was obtained from the Health Research Ethics Committee of the hospital. Information such as age, sex, month of admission, diagnoses, and outcome of management (such as death, discharged home or referred out) were obtained from the case notes and admission register. The diagnoses were based on clinical assessment and necessary investigations. Available laboratory investigations for patients in the children's emergency room include packed cell volume, HIV screening, dipstick urinalysis, random blood sugar, blood film microscopy for malaria parasite, serum electrolytes, urea and creatinine, blood grouping and cross-matching. Autopsies were not done as paediatric autopsy services were not fully established in our centre.

Data analysis

Data obtained were analyzed using the Statistical Package for the Social Sciences (SPSS) software version 20.0 for Windows® (IBM SPSS Inc. 2011 Chicago, Illinois, USA). Descriptive and inferential statistics were used to describe the frequencies and the association of the outcome variables. Chi-square and Fisher exact tests were used for tests of significance as appropriate. Significant level was set at p value of < 0.05.

Results

Out of the 9,151 paediatric cases seen in CHER within the study period, 5,884 (64.3%) were under-fives. Of these 5,884 under-fives, 56% percent of these were males, giving a male to female ratio of 1.2:1. Their ages ranged from 1-59 months with a median age of 12 months. Mean age was 18.01±14.19 months. Children less than 12 months of age accounted for 40% of under-five admission. (Table 1).

Table 1: Age and gender distribution of the study Population

Age group (months)	Gender Males	Females	Total (%)
<12	1319	1037	2356(40.0)
12-23	937	743	1680(28.6)
24-35	482	356	838(14.3)
36-47	293	227	520(8.8)
48-059	274	216	490(8.3)
Total	3305(56.0)	2579(44.0)	5884(100.0)

The month of January had the highest number of admissions every year except in 2009. The least number of admissions was recorded in the month of May yearly except in 2009 and 2010. The four commonest diagnoses made were malaria (34.3%), diarrheal disease (23.4%), respiratory tract infections (22.0%) and sepsis (5.2%) (Table 2).Together, they were responsible for 84.9% of total morbidities observed.

Table 3 shows that the frequencies of malaria, diarrheal disease and RTIs were significantly higher in the age group 12 - 60 month ($p < 0.001$) while sepsis was more frequent in those below the age of 12 months ($p < 0.001$). The respiratory tract infections recorded were pneumonias (42.5%), Rhinitis (38.3%), acute pharyngotonsilitis (12.4%), bronchiolitis (4.4%), acute otitis media (2.1%), and pertussis (0.3%).

Accidental poisonings accounted for 0.5% of all cases with higher proportion (80%) occurring in the age group 12 to 60 months. There was no gender difference ($p = 0.999$). Of all cases of accidental poisoning, 63.2% were due to kerosene poisoning.

Table 2: Causes of Under-five morbidity

Diagnosis	Frequency	Percentage (%)
Malaria	2019	34.3
Diarrheal disease	1378	23.4
Respiratory tract infections	1294	22.0
Sepsis	304	5.2
Acute asthma	150	2.5
Malnutrition	91	1.6
Meningitis	84	1.4
Skin infections	72	1.3
HIV/AIDS	35	0.6
Sickle cell disease	34	0.6
Trauma	34	0.6
Urinary tract infection	32	0.5
Accidental poisoning	32	0.5
Foreign body insertion	31	0.5
Adenotonsillar hypertrophy	21	0.4
Viral exanthems	19	0.3
Animal bites	8	0.1
Others*	246	4.2
Total	5884	100.0

*others include tuberculosis, hepatitis, helminthiasis and surgical emergencies

Table 3: Age variations of the most common causes of under-five morbidity

	Age group (months)			
Diagnosis (N)	<12	12 - 60	χ^2	P value
Malaria (2019)	656 (32.5)	1362 (67.5)	71.7	<0.001
Diarrheal disease (1378)	656 (47.6)	722 (52.4)	42.5	<0.001
RTIs (1294)	587 (45.5)	707 (54.6)	19.3	<0.001
Sepsis (304)	159 (52.3)	145 (47.7)	19.6	<0.001

RTIs = Respiratory tract infections

There were significant seasonal variations in the frequency of the morbidities. Cases of acute asthma occurred more during the wet season than dry season (61.3% vs. 38.7%, $\chi^2 = 11.26$, $p = 0.0008$). Frequency of diarrheal disease was higher during the dry season than wet season (60% vs 40%, $\chi^2 = 39.53$, $p < 0.001$). Malaria, RTIs and sepsis had no significant seasonal difference.

As regards the outcome of treatment, majority of the patients (72.2%, 4246/5884) were discharged home from CHER, 20.2% (1190/5884) were transferred to the in-patient ward, 3.2% (183/5884) were discharged against medical advice while 0.4% (22/5884) was referred out to other centres for continued care. Those referred out were predominantly cases of foreign body insertion and other surgical emergencies. There were 238 deaths giving an overall mortality rate of 4.0%. Death rate was higher in those below the age of 12 months than in those aged 12 to 60 months (5.8% vs. 3.2%, $\chi^2 = 21.34$, $p < 0.001$). The leading causes of death were malaria [27.7%], sepsis [21.8%], diarrheal disease [17.6%], RTIs [10.5%] and meningitis [10.1%] (see Table 4 below).

Table 4: Disease entities causing deaths among under-five children

Diagnosis	Number of Deaths	Percentage (%)
Malaria	66	28.0
Sepsis	52	22.0
Diarrheal disease	42	17.7
*RTIs	25	10.5
Meningitis	24	10.1
*SAM	11	4.6
HIV/AIDS	4	1.7
*SCD	1	0.4
Acute Asthma	1	0.4
Trauma	1	0.4
**Others	10	4.2
All causes	238	100.0

* RTIs= Respiratory tract infections, SCD= sickle cell disease, SAM= severe acute malnutrition **Others include surgical emergencies, hepatitis and tuberculosis

Table 5: Case fatality rates for the leading causes of under-five deaths

Diagnosis	Total Number	Number of Deaths	Case Fatality Rate (%)
Malaria	2019	66	3.3
Sepsis	304	52	17.1
Diarrheal disease	1378	42	3.1
RTIs	1294	25	1.9
Meningitis	84	24	28.6

* RTIs = Respiratory tract infections,

Discussion

The morbidity patterns of children differ in developed and developing countries. The pattern observed in our study which identified infectious diseases as the predominant causes of under-five morbidity is similar to the reports by most of the researchers in Africa.[3,4,6, 8,9,12]

The dry month of January was noted to have the highest number of admissions in our series. This finding is in tandem with the report from other centers in the Southern part of Nigeria such as Uyo[13] and Enugu[8] where the dry season of the year recorded higher numbers of admissions when compared to the wet season. Many infectious diseases thrive when the weather is cold and may be attributable to the fact that people are less active and spend most of their time indoors with inadequate ventilation which boosts the transmission of air-borne pathogens.[14]Besides, it is postulated that changes in environmental factors influence the host susceptibility to infection.[14] It has been proposed that dryness of the mucosal surfaces by dry air increases the probability of bacteremic spread by dust.[14] Furthermore, dry air and temperature changes may alter mucociliary function with increased predisposition to respiratory infections.[14]

On the contrary however, admissions from childhood illnesses peaked during the wet season of the year in the Gambia.[12]. Although seasonal variations of diseases is a common phenomenon, its epidemiological consequences may matter less in view of the climate change currently being experienced.[15]

Malaria, diarrheal disease and respiratory infections were the major contributors of under-5 morbidity in our centre, which agrees with global reports on the major causes of under-5 mortality.[7] This pattern has also been observed in several other earlier studies in Nigeria [4-6,8-9,16-18] and other African countries.[19, 20] These illnesses are preventable and underscore the need for intensification of various preventive measures such as exclusive breastfeeding, use of insecticide treated nets, routine immunization, hand washing, safe potable water, environmental sanitation which are already in place as well as development and strengthening of newer evidence-based interventional strategies such as the malaria vaccine, introduction of the Rota virus vaccine into the national immunization schedule and environmental modification in order to curb these ailments. Moreover the need to strengthen the primary health care (PHC) system which is the first point of contact of the individual with the national health system becomes more obvious. The fact that malaria still plays a significant role towards childhood illnesses brings to fore the unrealized goals of the various malaria control measures. This therefore calls for strengthening and scaling up of these various measures such as enhanced environmental sanitation, use of insecticide treated nets and improved health systems and institutions. Strengthening of the health institutions would among other things enhance early detection and intervention.

The enormity of diarrheal morbidity despite the far reaching campaign of improved hygiene, hand washing, use of oral rehydration salts and zinc tablets gives credence to the prompt need to include the rotavirus vaccine into the Nigerian national routine childhood immunization schedule as a means to reduce the burden of diarrhea. Poor utilization of ORT for home management of diarrhoea, poor environmental hygiene and low exclusive breast feeding practices are some of the reasons adduced by some authors that may explain the continued high burden of diarrhoeal diseases in our environment. [21,22,23,24]

Respiratory infection remains a worrisome childhood illness which many childhood vaccines have targeted. Immunization against Hemophilus influenza type B, pneumococcus, measles and pertussis is the most effective way to prevent pneumonia.[25]Other preventive measures such as exclusive breastfeeding and avoidance of indoor air pollution caused by cooking with biomass fuels, crowded homes and parental smoking should be strengthened.[25]

Sepsis accounted for 5.2% of the morbidity of under-fives in our series. This is higher when compared to the 3% observed in Abakaliki.[26]. Other studies had earlier observed sepsis as important contributor to child morbidity.[5, 27, 28]Besides, sepsis was noted to be a significant contributor of morbidity in infants compared to those beyond infancy in our series. This agrees with a study in Asaba where over 50% of their subjects with sepsis were infants.[9] This may be attributable to the immature immune system of the infants which does not only make them more susceptible to attack by microbial agents but encourages multiplication of offending microorganisms.[29]

Accidental poisoning was a recognizable contributor to under-five morbidity in our study responsible for 0.5% of the cases. This is similar to the report by other Nigerian authors such as Bassey and colleagues[13] in Uyo and Adejuyigbe et al[30] in Ile-Ife. Majority of the cases of poisoning was caused by kerosene ingestion. This agrees with some studies on accidental poisoning in the emergency room.[30-32] It reflects the commonly used and accessible cooking fuel in most homes in our locality and may also be attributable to the improper storage of this chemical in various homes.

The overall death rate of 4% in our study is comparable to the findings of Edelu et al[8] in Enugu. It is however higher than 2.8% documented in Port Harcourt[33] and 2.7% reported in Uyo[13] but lower than the rates of 5.8%, 9.6% and 11.2% documented in Asaba,[9] Aba[16] and Gusau[5] respectively. The reason for the variance in mortality rates might be due to the differences in existing local facilities and perhaps the parental health seeking behavior in the different regions. Studies have reported poor health care seeking behaviours in Nigerian parents especially as regards child health.[34,35] Timely and appropriate health care seeking behaviour by caregivers of children have been observed to significantly affect child survival and health outcome.[34] Besides, the mortality rates may be a reflection of the severity of illness at presentation and the quality of treatment of patients in the various emergency rooms.[36] In a study by Okposio et al,[37] late presentation was noted to be almost five times more likely to have a poor disease outcome. Mortality occurred significantly more in the infantile age period and this have been reported by several other studies.[16,38,3] Morakinyo in 2017,[40] observed that mothers' age, child's gender, delivery method and marital status were significant predictors of infantile death in Nigeria. Case fatality rates for sepsis and meningitis ranked top in our series and this is similar to findings in Nnewi and Enugu.[38,39] This perhaps calls for an improvement in the case management of these disease entities.

Limitation of the study

This was a retrospective study which is prone to certain limitations such as the number of patients that have access to the hospital as well as incomplete documentation of data and thus may not reflect the prevalence of the disease entities in the community. However the cases seen will still represent a pattern and enormity of the disease in the environment.

Conclusion

This study has observed that the most common presentation of the under-fives in our emergency room were malaria, diarrheal disease, respiratory infections and sepsis.

These also constitute the predominant causes of mortality. A goal-targeted, disease specific preventive measure based on the five levels of prevention is recommended.

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Authors' Contribution

Ibeneme CA: Study concept and design, collecting, analyzing and interpreting the data, manuscript writing, revising and approval of the work.

Ezuruike EO: Design of study, analysis of data, manuscript writing, revising and approval of the work.

Korie FC: Design of study, analysis of data, manuscript review and approval of the work.

Chukwudi NK: Design of study, analysis of data, manuscript review and approval of the work.

Ukpabi IK: Design of study, analysis of data, manuscript review and approval of the work.

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