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Morbidity and mortality patterns of post-neonatal paediatric medical admissions in a large mission hospital in Benin City, Nigeria

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ABSTRACT

This study was conducted to determine the morbidity and mortality pattern in children admitted into a mission hospital and to compare the results with those obtained from public hospitals. It was a retrospective study that reviewed the admission and outpatient attendance registers as well as the case records of all children aged between one month and 14 years admitted into St. Philomena Catholic Hospital (SPCH), Benin City, from 1st January 2000 to 31st December 2001. Out of the 8172 children seen at the paediatric outpatient clinic, 1210 (14.8%) were admitted; comprising of 646 (53.4%) males and 564 (46.6%) females. Under-fives accounted for 84.0% of these admissions. Slightly more cases were admitted during the wet season 632 (52.3%) than the dry season 578 (47.7%). Malaria and its complications (61.1%), gastroenteritis (16.6%) and acute lower respiratory tract infection (ALRTI) (8.7%) were the three commonest causes of childhood hospitalisation. Other causes include anaemia (3.7%), measles (3.6%) and febrile convulsion (3.3%). Overall, mortality rate was 4.1%, with under-fives accounting for 92.0% of these deaths. Mortality rate in under-fives was 18.0%, while mortality rate was 1.7 times higher in girls than boys. The commonest causes of death were malaria and its complications (52.0%), anaemia (18.0%), gastroenteritis (14.0%), measles (8.0%) and ALRTI (6.0%). High case fatality rates were found in cerebral malaria (27.8%), anaemia (20.0%), meningitis (20.0%) and measles (9.1%). The commonest cause of death among infants (excluding neonates) was gastroenteritis, while malaria-induced anaemia was the commonest cause of death among children aged 1–4 years. Malaria and its complications, gastroenteritis, ALRTI and severe anaemia are the most important causes of childhood morbidity and mortality in Benin City. Health interventions aimed at controlling these diseases should be strengthened if childhood morbidity and mortality are to be significantly reduced. Greater resources should be allocated to the health care needs of under-fives especially during the wet season.

INTRODUCTION

Hospital admission data can be a valuable tool for assessing the epidemiology of diseases within populations. With minimum data collection, substantial insight can be had into the types of diseases, the age at which conditions present and their burden on in-patient service. There are few reports on childhood morbidity and mortality from private health institutions. Majority of the health statistics on pattern of childhood morbidity and mortality in Nigeria are derived

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from data obtained from the nation's teaching hospitals. Previous reports from these teaching hospitals indicate that acute lower respiratory tract infections (ALRTI), gastroenteritis and anaemia were the most common medical causes of childhood hospital admissions.[1-4] A similar finding has also been reported in a previous study in a private hospital in Enugu.[5] This is in contrast to the report of a recent study in a private hospital in Lagos, which showed that malaria was the commonest cause of childhood hospitalisation.[6]

Knowledge of the morbidity profile enables policymakers, health care planners and managers to reach informed decisions on allocation of human and material resources to the various areas within the health subsector. Also, an estimate of disease-specific burden is required for setting national priorities for health. Sources of data for such an estimate must include both public and private health institutions in Nigeria. Using data from public health institutions only may not depict the true childhood morbidity and mortality patterns for the nation.

In recent years, in Nigeria, there has been tremendous increase in the number of private health facilities that provide health care services for children. Thus, they contribute significantly to the provision of health care to the populace. Therefore, data from private health institutions are required to give a balanced picture of childhood morbidity and mortality pattern in Nigeria. This study sought to determine the morbidity and mortality pattern amongst children admitted into a mission hospital and compare the results with those obtained from public hospitals.

PATIENTS AND METHODS

This retrospective study was conducted at St. Philomena Catholic Hospital (SPCH), Benin City. SPCH is a mission hospital established 62 years ago and is located in the centre of Benin City, the Edo State capital. Its paediatric section consists of a special care baby unit (SCBU) with eight cots and three functioning incubators, and a children's ward with 24 beds and two semi-private rooms each with two beds. The hospital has a fairly equipped laboratory capable of performing routine laboratory investigations such as blood smears for malaria parasites, full blood count, urinalysis and urine culture. Other investigations performed include genotype, serum urea and electrolytes, bilirubin, protein, alkaline phosphatase, blood grouping and cross-matching. It also has a good blood bank facility. Other hospitals in Benin City (both public and private) also make use of SPCH's laboratory and blood bank facilities. The laboratory and blood bank have 24-hour coverage by six trained full-time medical laboratory scientists.

The paediatric section enjoys 24-hour coverage by a consultant paediatrician, resident doctors (senior registrars) from the University of Benin Teaching Hospital (UBTH), four senior medical officers and two medical officers (with five-year and three-year post-qualification experience respectively). The nursing personnel consist of a trained paediatric nurse and 10 trained staff nurse-midwives. The hospital patients consist of private fee-paying patients and staff/ dependants of private companies, which have retained the services of the hospital. The patients therefore represent various strata of the society cutting across social classes, religions and ethnic groups. The place of residence of majority of the patients extended from the immediate location of the hospital to a distance as far as 50km approximately.

The admission registers and case notes of all children aged one month to 14 years admitted into the hospital from 1st January 2000 to 31st December 2001 were examined and the relevant information extracted. The case notes were well kept and easy to retrieve from the records section. Information obtained from the case notes and registers include date of admission, ethnic group, place of residence,

age, sex and main diagnosis. The outcome of hospitalisation such as deaths and discharges were noted for each patient. The principal reason for admission of the child was accepted as the main diagnosis, which was determined by the consultant paediatrician. The paediatric outpatient clinic attendance registers were examined to obtain data on total number of children seen at the hospital for the two-year period. The data obtained were analysed and the results compared with those of previous studies from the teaching hospitals in Nigeria. Permission to conduct this study was sought and obtained from the chief medical officer of the hospital.

In this study, the seasons were defined as the wet season (May to October) and the dry season (November to April) in accordance with the well-known characteristics of the climate of Nigeria.[7,8]

Statistical analysis involved calculation of percentages, ratios, averages and confidence intervals. The Z-test and chi square test were used in ascertaining the level of significance of differences, which was set at $p < 0.05$.

RESULTS

Overall admission rate

During the two-year period, a total of 8,172 children (aged one month to 14 years) were seen at the outpatient clinic of the hospital. Of this number, 1,210 (14.8%) were admitted into the children's ward. The average in-patient census was 50 patients, corresponding to a bed occupancy rate of 179.0%

Sex and age group of children admitted

Among the 1,210 children who were admitted, 646 (53.4%) were males while 564 (46.6%)

Table 1 **Age and sex distribution of children admitted**

Age group (years)	Sex			Z-statistic (p value)
	Male (%)	Female (%)	Total (%)	
< 1	194 (53.6)	168 (46.4)	362 (29.9%)	1.370 (>0.05)
1–4	353 (53.9)	302 (46.1)	655 (54.1)	1.996 (<0.05)
5–14	101 (52.3)	92 (47.7)	193 (16.0)	0.639 (>0.05)
Total (%)	646 (53.4)	564 (46.6)	1210 (100.0)	2.365 (<0.05)

Table 2 **Main diagnosis in the study population**

Main diagnosis in hospitalised children	No. of children admitted	Percentage of total admitted
Malaria (uncomplicated)	541	44.7
Malaria with severe anaemia	180	14.9
Cerebral malaria	18	1.5
Gastroenteritis	201	16.6
ALRTI	105	8.7
Anaemia (excluding SCA)	45	3.7
Measles	44	3.6
Febrile convulsion	40	3.3
Sickle cell anaemia (SCA)	13	1.1
Acute severe asthma	7	0.6
Acute poisoning	7	0.6
Meningitis	5	0.4
Epilepsy	4	0.3
Total	210	100

ALRTI = Acute lower respiratory tract infection

were females (Z-statistic = 2.365 $p < 0.05$). Male to female ratio was 1.2:1, while the average patient age was 5.1 years (95% CI = 4.8–5.3). Eighty four per cent of the children were less than five years old and 29.9% were aged less than one year. Of the 201 patients with gastroenteritis, 109 (54.2%) were less than one year old.

Re-admission rate

A total of 43 (3.6%) children were admitted twice while 11 (0.9%) children were admitted three times; representing a re-admission rate of 4.5%.

Ethnic origin

The various ethnic groups represented among the hospitalised children were: Bini (47.8%),

Table 3 **Seasonal distribution of main diagnosis**

Main diagnosis in hospitalised children	Wet season	Dry season	Total	Z-statistic (p value)
Malaria (uncomplicated)	296 (54.7)	245 (45.3)	541	2.186 (<0.05)
Malaria with severe anaemia	105 (58.3)	75 (41.7)	180	2.227 (<0.05)
Cerebral malaria	11 (61.1)	7(38.9)	18	0.942 (>0.05)
Gastroenteritis	177 (88.1)	24 (11.9)	201	10.819 (<0.001)
ALRTI	47 (44.8)	58 (55.2)	105	1.066 (>0.05)
Anaemia (excluding SCA)	33 (73.3)	12 (26.7)	45	3.125 (<0.01)
Measles	10 (22.7)	34 (77.3)	44	3.623 (<0.001)
Febrile convulsion	30 (75.0)	10 (25.0)	40	3.162 (<0.01)
Sickle cell anaemia	8 (61.5)	5 (38.5)	13	0.829 (>0.05)
Acute severe asthma	4 (57.1)	3 (45.9)	7	0.376 (>0.05)
Acute poisoning	3 (42.8)	4 (57.2)	7	0.376 (>0.05)
Meningitis	2 (40.0)	3 (60.0)	5	0.447 (>0.05)
Epilepsy	2 (75.0)	1 (25.0)	4	1.000 (>0.05)
Total	729 (60.2)	481 (39.8)	1210	7.095 (< 0.001)

Figures in parentheses are percentages

Table 4 **Principal causes of childhood admissions in the present study compared to previous studies in Nigeria**

Main diagnosis in the study population (n = 1210)	Percentage from each study centre				
	Benin City (current study)	Enugu[5] (1976)	Benin City[1] (1980)	Ilesha[9] (1996)	Lagos[6] (1998)
Malaria (uncomplicated)	44.7	–	2.6	7.9	17.8
Malaria with severe anaemia	14.9	–	–	–	–
Cerebral malaria	1.5	–	–	–	–
Gastroenteritis	16.6	22.5	27.0	14.4	16.8
ALRTI	8.7	15.0	29.6	15.2	13.8
Anaemia (excluding SCA)	3.7	–	3.0	7.3	1.9
Measles	3.6	–	17.0	5.3	5.2
Febrile convulsion	3.3	20	5.0	8.4	5.1
Sickle cell anaemia	1.1	–	2.7	2.6	1.9
Acute severe asthma	0.6	–	–	–	–
Acute poisoning	0.6	10.0	–	–	–
Meningitis	0.4	–	–	–	–
Epilepsy	0.3	–	–	–	–

Igbo (20.6%), Ishan (13.0%), Urhobo/Isoko/Ijaw (6.7%), Etsako (5.2%), Yoruba (4.1%), non-Nigerians (1.9%) and others (0.7%). Analysis comparing mortality rates amongst the various ethnic groups did not show any difference.

Season and rate of hospitalisation

Out of the 1,210 children admitted, 632 (52.2%) were admitted during the wet season, while the remaining 578 (47.8%) were admitted during the dry season (Z-statistics = 1.530 $p > 0.05$).

Season and main diagnosis

Of all cases of gastroenteritis, febrile convulsions and severe anaemia, 88.1%, 75.0% and 73.3% respectively were admitted during the wet season while the corresponding morbidities admitted during the dry season were measles (77.3%) and acute lower respiratory tract infection (55.2%). Of the 739 cases of malaria and its complications admitted, 412 (55.8%) were admitted during the wet season, while the remaining 327 (44.2%) were admitted during the dry season (Z-statistics = 3.153 $p < 0.01$).

Table 5 **Mortality by sex and by age**

Age group (years)	Sex					
	Male		Female		Both sexes combined	
	No. of children admitted	No. of deaths (%) admitted	No. of children admitted	No. of deaths (%)	Total no. of children	Total no. of deaths
< 1	194	7 (3.6)	168	11 (6.5)	362	18 (5.0)
1–4	353	11 (3.1)	302	17 (5.6)	655	28 (4.3)
5–14	101	2 (0.0)	92	2 (2.2)	193	4 (2.1)
Total	646	20 (3.1)	564	30 (5.3)	1210	50 (4.1)

Figures in parentheses are percentages

Table 6 **Case fatality rates by main diagnosis**

Main diagnosis in the study population	No. of children admitted	No. of deaths	% Case fatality rate
Malaria (uncomplicated)	541	6	1.1
Malaria with severe anaemia	180	15	8.3
Cerebral malaria	18	5	27.8
Gastroenteritis	201	7	3.5
ALRTI	105	3	2.9
Anaemia (excluding SCA)	45	9	20.0
Measles	44	4	9.1
Febrile convulsion	40	–	0
Sickle cell anaemia (SCA)	13	–	0
Acute severe asthma	7	–	0
Acute poisoning	7	–	0
Meningitis	5	1	20.0
Epilepsy	4	–	0
Total	1210	50	4.1

Sex, Mortality and Season

Fifty (4.1%) of the 1,210 children admitted died, consisting of 20 (40.0%) males and 30 (60.0%) females (Z-statistic = 3.162 $p < 0.001$). The death rate during the wet season was 26 (2.1%), while it was 24 (2.0%) during the dry season ($\chi^2 = 1.298$ $p > 0.05$). Eleven (42.3%) of the 26 deaths during the wet season were boys, while the remaining 15 (57.7%) were girls (Z-statistic = 0.785 $p > 0.05$). Twenty four children died during the dry season, consisting of 9 (37.5%) boys and 15 (62.5%) girls (Z- statistic = 1.225 $p > 0.05$).

Table 1 shows that under-fives and those aged 5–14 years accounted for 84.0% and 16.0% of all admissions respectively (Z statistic = 29.728 $p < 0.001$). More boys than girls were admitted for all age groups, with a statistically significant difference obtained in the 1–4 years age group.

Table 2 shows that simple malaria as well as complicated malaria was the major cause of hospitalisation, accounting for 61.1% of total admissions. Other important causes of admission were gastroenteritis, acute lower respiratory tract infection (ALRTI) and anaemia.

The rate of admission was one and a half times higher in the wet season than in the dry season (Table 3). The major causes of hospitalisation during the wet season were malaria and its complications, gastroenteritis, anaemia and febrile convulsion. The major causes of hospitalization during the dry season were malaria and its complications, ALRTI and measles.

There was a remarkable increase in the proportion of cases admitted for malaria and its complications in the current study when compared to previous studies (Table 4). The proportion of cases admitted for gastroenteritis remained unchanged from 1996 to 2001. There was a marked decrease in the proportion of admissions due to ALRTI and measles.

Table 4 shows that 92.0% of deaths occurred in under-fives with an under-five mortality rate of 18.0%. Overall mortality rate was 4.1%, with 5.3% for girls and 3.1% for boys, which corresponds to 60.0% and 40.0% of total deaths respectively (Z-statistic = 1.414 $p > 0.05$). Male to female ratio was 1:1.5. Children aged less than one year accounted for 36.0% of all deaths while all the other age

Table 7 **Age distribution of associated causes of deaths (n = 50)**

Associated causes of death	Age group (years)		
	< 1	**1–4**	**5–14**
Malaria severe	2 (4.0)	3 (6.0)	1 (2.0)
Malaria with anaemia	2 (6.0)	12 (24.0)	1 (2.0)
Cerebral malaria	3 (6.0)	2 (4.0)	0 (0)
Gastroenteritis	6 (12.0)	1 (2.0)	0 (0)
ALRTI	3 (6.0)	1 (2.0)	1 (2.0)
Anaemia (excluding SCA)	0 (0)	5 (10.0)	1 (2.0)
Measles	1 (2.0)	3 (6.0)	0 (0)
Febrile convulsion	0 (0)	0 (0)	0 (0)
Sickle cell anaemia	0 (0)	0 (0)	0 (0)
Acute severe asthma	0 (0)	0 (0)	0 (0)
Acute poisoning	0 (0)	0 (0)	0 (0)
Meningitis	1 (2.0)	0 (0)	0 (0)
Epilepsy	0 (0)	0 (0)	0 (0)
Total	19 (38.0)	27 (54.0)	4 (8.0)

Figures in parentheses are percentages

groups put together accounted for 64.0% of all deaths (Z-statistic = 9.291 $p < 0.001$).

The highest case-fatality rate was among children with cerebral malaria, followed by anaemia and meningitis (Table 6). Out of the 50 deaths, malaria and its complications accounted for 52.0%, anaemia 18.0%, gastroenteritis 14.0% and measles 8.0%. The leading cause of death in infants less than one year old was gastroenteritis, while it was malaria with severe anaemia in the 1–4 years age group (Table 7).

DISCUSSION

In consonance with previous reports,[6,9,10] majority of the children (84.0%) requiring hospitalisation in this study were less than five years old, further confirming the vulnerability of under-fives to various illnesses. This may be explained by the fact that at this period of life the passively acquired maternal immunity is already waning and the child is still developing his/her own natural immunity.[11] As a result, the child is susceptible to various infections such as malaria, acute respiratory infections and measles. Also, because of lack of safe water and poor sanitation in the homes as well as unhygienic handling of the infant's feeds he/she suffers from recurrent episodes of diarrhoea.[12,13]

Significantly more boys than girls were admitted during the period covered by this review. Similar gender differentials in rates of hospitalisation have been reported in Lagos[6] and Catalonia.[14] There is no ready explanation for the male preponderance in hospital admissions. It is possible that parents have a higher tendency to accept hospital admissions for their ill sons than for their ill daughters. This is probably because of the cultural parental preference for male children. This would however require further research and would be the focus of another study.

The rate of hospitalisation was significantly higher during the wet season than the dry season, suggesting that there may be seasonal variations in childhood morbidities in our communities. This is similar to findings from Gambia.[15] Comparison with previous studies was however not possible because the authors did not analyse their hospital admission rates according to season. Increased hospitalisation during the wet season may be explained by our finding that the major causes of admission such as malaria and its complications, gastroenteritis, anaemia and febrile convulsion occur more frequently during the wet season than during the dry season. The leading role of malaria as a cause of childhood hospitalisation and mortality in this study has also been documented by other investigators in Nigeria[6] and other African countries such as Sierra Leone,[16] Ethiopia[17] and Kenya.[18] In contrast, malaria ranked very low as a cause of childhood hospital admissions in previous studies in the teaching hospitals in Benin,[1] Ibadan,[2] Ilorin,[3] Port Harcourt[4] and a private hospital in Enugu.[5] A possible explanation is the changing pattern of malaria with increasing incidence of resistance to various anti-malarial drugs in recent years.[19,20] This also explains the leading role of malaria as a cause of childhood mortality in this study.

Drug resistance may lead to treatment failures. Delay in recognising treatment failures may lead to death. These studies[1-5] were conducted over 15 years ago. In view of the fact that malaria ranks first as a cause of childhood hospitalisation, any plan to reduce childhood morbidity rate in Nigeria (and perhaps other malaria endemic countries) must include early diagnosis, prompt and adequate treatment and prevention of malaria in children. Fortunately, the Roll Back Malaria programme and the use of insecticide treated bed nets currently being advocated are useful health interventions to curtail the escalating threat from malaria.

Two other principal causes of hospitalisation in this study and that of Lagos[6] are gastroenteritis and ALRTI. Reports from other African countries also confirm the leading

role of these preventable diseases as causes of childhood morbidity and mortality.[16-18] This underlies the need to strengthen preventive paediatrics. On the other hand, there is a lower proportion of cases admitted for ALRTI and measles as compared to previous studies.[1-6,9,10] This may be explained by the improvement in immunization coverage against the target diseases covered by the expanded programme on immunization and the current breast-feeding practices being advocated.

The overall mortality rate of 4.1% reported here is in agreement with the 4.0% reported in Ilesha[9] but higher than the 2.5% reported in Lagos.[6] However, it is lower than figures obtained at the teaching hospitals in Ibadan[2] and Ilorin.[3] This may be explained by the fact that critically ill children are referred to these teaching hospitals from both private and public health facilities late in the disease process, after delays and unsuccessful treatments. In consonance with reports from Lagos,[6] Ibadan,[2] Ilorin,[3] and Port Harcourt,[4] majority of the deaths in this series occurred among under-fives, thus indicating their vulnerability and the need to pay special attention to this group of children if an overall reduction in child mortality rate is to be achieved.

In this study, female child mortality rate was 1.5 times higher than male child mortality. Reports from Burkina Faso,[21] United States of America (Blacks)[22] and India[23-25] confirm this trend. The reason for this gender differential in child mortality is not clear. However, in the reports from India, reasons adduced include preference for sons and health care seeking practices. For example, the report indicated that girls are often brought to health facilities in more advance stages of illness than boys, are taken to less qualified doctors when they are ill, and less money is spent on medicines for them than for the boys.[25-27] However, studies are required to determine whether the same reasons of gender differences are applicable in Nigeria.

Indeed, despite the fact that more males than females were hospitalised, mortality rate was higher among females in this series. This implies that intervention programmes aimed at reducing child mortality would need to correct the bias against girls if equitable access to health care is to be achieved. In consonance with previous reports[1-6,9,10] preventable diseases such as anaemia, gastroenteritis, measles and ALRTI are other important causes of death in this series. Fortunately, the core programme of integrated management of childhood illnesses (IMCI) strategy is planned to address the five most important causes of childhood death in the developing world. The five target diseases include respiratory infections, diarrhoea, measles, malaria and malnutrition (anaemia may be nutritional), all of which were found to be important causes of childhood deaths in this series.

Other child health interventions such as the immunization programme, oral re-hydration therapy and the baby-friendly hospital initiative are all steps in the right direction. With sincerity and commitment in their implementation by government as well as by health care planners and managers, childhood mortality rate will be substantially reduced in Nigeria.

The commonest causes of death among infants (excluding neonates) and children aged 1–4 years were gastroenteritis and malaria-induced anaemia respectively. The implication is that any health intervention to reduce under-five mortality rate must address the prevention and control of this two disease entities. It should be noted that although hospital admission data are inevitably referral and access biased, they can provide useful information on morbidity and mortality in the community.

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