

Paediatric Morbidity and Mortality in a Suburban Hospital in Jos, North -Central Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Author BOT did the study concept/design, interpretation of data and writing of manuscript. Authors IAE and MI did the data acquisition, statistical analysis and literature searches while analyses of study and review of manuscript were done by authors MG, HA and DS. All authors read and approved the final manuscript.

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ABSTRACT

Background: Even though there has been some decline in childhood mortality, figures still remain high in sub-Saharan Africa. The pattern of morbidity and mortality in health care institutions may be a reflection of the disease burden of the community which it serves and will facilitate prevention/control strategies. This study was conducted to determine the pattern of paediatric morbidity and mortality in a secondary level hospital in a sub-urban area in Jos, North-central Nigeria.

Materials and Methods: This retrospective study is a review of paediatric admissions into the Vom Christian Hospital. Relevant data on all children who were admitted into the Vom Christian Hospital

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between May 2012 and April 2013 with medical conditions were retrieved from the admissions records. Data were entered into excel spread sheet and analyzed using Epi info 7. A $p < 0.05$ was considered statistically significant.

Results: A total of 334 children aged between one day and 15 years were admitted during the period, out of which 235 (70.4%) were children less than 5 years old. Infections (221, 66.2%) were the major causes of morbidity. Out of all the 334 admissions, 304(91%) were discharged, 7 (2.1%) left against medical advice, 6(1.8%) were referred, while 17 (5.1%) died. Malaria was the commonest cause of morbidity (102, 30.5%) and mortality (6, 35.3%). Severe protein energy malnutrition had the highest case fatality rate (25%).

Conclusion: The burden of paediatric morbidity and mortality is in children under 5 years and are mainly preventable. An emphasis on malaria eradication and child survival strategies will help to reduce childhood morbidity and mortality.

Keywords: Paediatric; morbidity; mortality; Nigeria.

1. INTRODUCTION

There has been some decline in childhood mortality since 1990, however, significant disparities in child mortality persists across the regions of the world [1]. Sub-Saharan Africa continues to lag behind other regions, both in terms of its overall reduction in the under-five mortality rate (U5MR) and its pace of decline in the total number of under-five deaths. The region accounted for 50% of all under-five deaths by 2012 [1]. Most of these deaths are still from preventable causes like Pneumonia, diarrhoea, malaria, undernutrition and neonatal complications [1]. Nigeria contributes 13% of all under five deaths worldwide, ranking 9th globally with an U5MR of 124/1000 (2012) [1]. Although there are relatively fewer studies amongst children above five years of age, the causes of morbidity and mortality in this age group include septicemia, malaria, respiratory infections, meningitis, malignancies, tetanus, cardiovascular and renal diseases, amongst others, with mortality rates of between 10 -20% of admissions in some reports [2–4].

In Nigeria, with a total population of over 162 million, 50% of the population live in rural areas [5]. Various national surveys in Nigeria have indicated higher childhood mortality rates in rural areas where there are fewer facilities and health personnel, compared to urban areas [6,7]. Studies in developing countries have indicated varying causes of morbidities with varying case fatality rates [8–11]. These should be determined for every community in order to identify the prevailing health needs and strategize to effectively address these problems. The pattern of admissions in health care institutions may be a reflection of the disease burden and health needs of the community which it serves.

Furthermore, this information will serve as a baseline for subsequent reviews. There is paucity of data on paediatric morbidity and mortality in Northern Nigeria and particularly in Vom. The objective of this study was to determine the pattern of paediatric admissions, major causes of morbidity and mortality at Vom Christian Hospital located in a sub- urban area in North -Central Nigeria.

2. MATERIALS AND METHODS

2.1 Study Setting and Subjects

In Nigeria the national health care system is structured on the basis of the three-tier responsibilities of the Federal, State and Local Governments [12]. The primary health care clinic is the entry point to the health care system, the secondary health care level provide specialized care to patients referred from the primary care, while specialized tertiary care is provided by the teaching hospitals and other special hospitals. The referral system however is in effective and patients can be self-referred to any level. The private sector can provide health care at any of the three levels depending on the services they offer. The study was conducted at Vom Christian Hospital (VCH), a secondary level mission hospital situated in Vom, a sub- urban area in Jos South Local Government Area (LGA), North-Central Nigeria. Most of the patients are from the local communities. Patients usually present directly to the hospital or may be referred from the primary level clinics. Patients referred from primary level care are usually referred back. The hospital has a total bed capacity of 300 beds, while the children's ward has 34 beds. There is no dedicated children's emergency unit, but children are admitted either through the accident and emergency unit or through the general

outpatient clinic. In addition, the hospital also has a small neonatal unit with a capacity for 6 babies which has an inborn and outcome section where sick neonates that require close monitoring are admitted. Other neonates are admitted beside their mothers in the post natal ward.

The paediatric department of the Jos University Teaching Hospital started posting trainee residents to Vom Christian hospital in May 2012 for the community paediatric posting after signing memorandum of understanding (MOU) with the hospital. This was sequel to the review of the postgraduate training curricula of the National and West African Colleges in 2011, in order to train paediatricians with a broad thinking perspective and to meet the health needs in the country. The posting commenced in May 2012 with the posting of the first trainee resident there, under the supervision of consultants from the department. Each posting lasted for two months according to the College requirements. The outpatient paediatric consultations are done by the paediatric residents, medical officers, family medicine residents and paediatric consultants/fellows. However the inpatients are only managed by the paediatric residents and consultants. The average number of paediatric consultations ranges from 30 to 39 per day.

2.2 Study Design and Data Collection

This was a retrospective descriptive study of all paediatric admissions into the hospital over a one year period, from May 2012 to April 2013. An admissions / discharge register was opened and kept of all children aged between birth to <18 years who were admitted into the paediatric unit of the hospital. The register was updated daily and was checked regularly by the supervising consultants. Data of all consecutive admissions of all children with medical conditions were entered into the register. Surgical, gynaecological and obstetric cases were excluded. The records of all children admitted from May 2012 to April 2013 were retrieved from the register. Data collected included date of admission, age, gender, anthropometry, final diagnosis, treatment, outcome, date of discharge or death, etc.

2.3 Ethical Considerations

Ethical clearance was obtained from the Human Research Ethics Committee of the Jos University Teaching Hospital, Jos (no: 5932) and the study

was approved by the management of the Vom Christian Hospital.

2.4 Data Analysis

Data were entered into excel spread sheet and analyzed using Epi info 7. Percentages were derived and tables and charts were drawn. The association between gender and mortality was analyzed using chi – square test for categorical data considering as statistically significant if less than 5% p.

3. RESULTS

A total of 334 children aged between one day and 15 years were admitted during the one year period, 191 male and 143 female giving a male: female ratio of 1.3: 1. Fifty- six (16.8%) were aged < 2 months, 179 (53.6%) were between the ages of 2 months and < 5years, while 99 (29.6%) were 5years or older. Thus, 70.4% (235) of all the paediatric admissions were children under the age of 5 years.

3.1 Outcome

Out of all the 334 admissions, 304(91%) were discharged, 7 (2.1%) left against medical advice, 6(1.8%) were referred to higher level institutions that had higher facilities, while 17 (5.1%) died.

3.2 Morbidities

Malaria was the most common morbidity amongst all the children accounting for 30.5% (102) of all admissions during the period. This was followed by septicemia (55, 16.5%) and sickle cell disease (30, 9.0%). The other causes of morbidity are shown in Table 1. The main causes of morbidity in the various age groups are also shown in Table 1. Septicemia was the most common diagnosis among infants under 2 months of age (24, 42.9%). This was followed by perinatal asphyxia (17, 30.4%) and prematurity (6, 10.7%). In children between 2 months and < 5 years, malaria was the most common morbidity accounting for 69 (38.6%) of the 179 children admitted. Other morbidities in this age group included septicemia (27, 15.1%), pneumonia (17, 9.5%), acute gastroenteritis (14, 7.8%), etc. Amongst children aged 5 years and above, malaria was still the most common diagnosis (31, 31.3%), followed by sickle cell disease (24, 24.2%) and acute bacterial meningitis (11, 11.1%). The causes of meningitis included

Streptococcus pneumonia and *Neisseria meningitides*, while in those under 5 years *Haemophilus influenza* and *Streptococcus pneumoniae* were the common pathogens.

3.3 Mortalities

Seventeen of the 334 children admitted during the period died, giving a mortality rate of 5.1%. These were made up of 11 male and 6 female, the difference was however not statistically significant ($\chi^2 = 0.41$, $P = 0.52$). Twelve (70.6%) of the children that died were between 2 months - <5 years old, while 3 (17.7%) were <2 months of age. Thus, the majority of the Children that died were under 5 years old (15, 88.3%).

Infections contributed to 76.5% of the mortalities. In terms of specific diagnosis, malaria was the most common cause of mortality (6, 35.3%), followed by acute bacterial meningitis (4, 23.5%). The other causes of deaths and their contribution to the total mortalities are shown in Table 2.

With regards to case fatality however, severe protein energy malnutrition (PEM) had the highest case fatality rate (25%), followed by acute bacterial meningitis and prematurity (16.7% each). The case fatality rates (CFR) for the other diseases are also shown in Table 2. Table 3 shows the frequency of mortalities by diagnoses and age group. All the mortalities in children ≥ 5 years, (2, 100%) were from meningitis. All the children that died from malaria (6, 35.3%), were within the age group 2 months - < 5 years and they constituted 50% of the mortalities in this age group. The trend of morbidities and mortalities over the one year period is shown in Fig. 1. There were two peak periods of admissions/ morbidities; November 2012 (highest peak) and a 2nd peak in July 2012. Similarly, the highest peak of mortalities was in November 2012; with a 2nd peak in February 2013. Fig. 2 shows the monthly mortality rates over the one year period. The highest mortality rate (17.7%) was in February 2013.

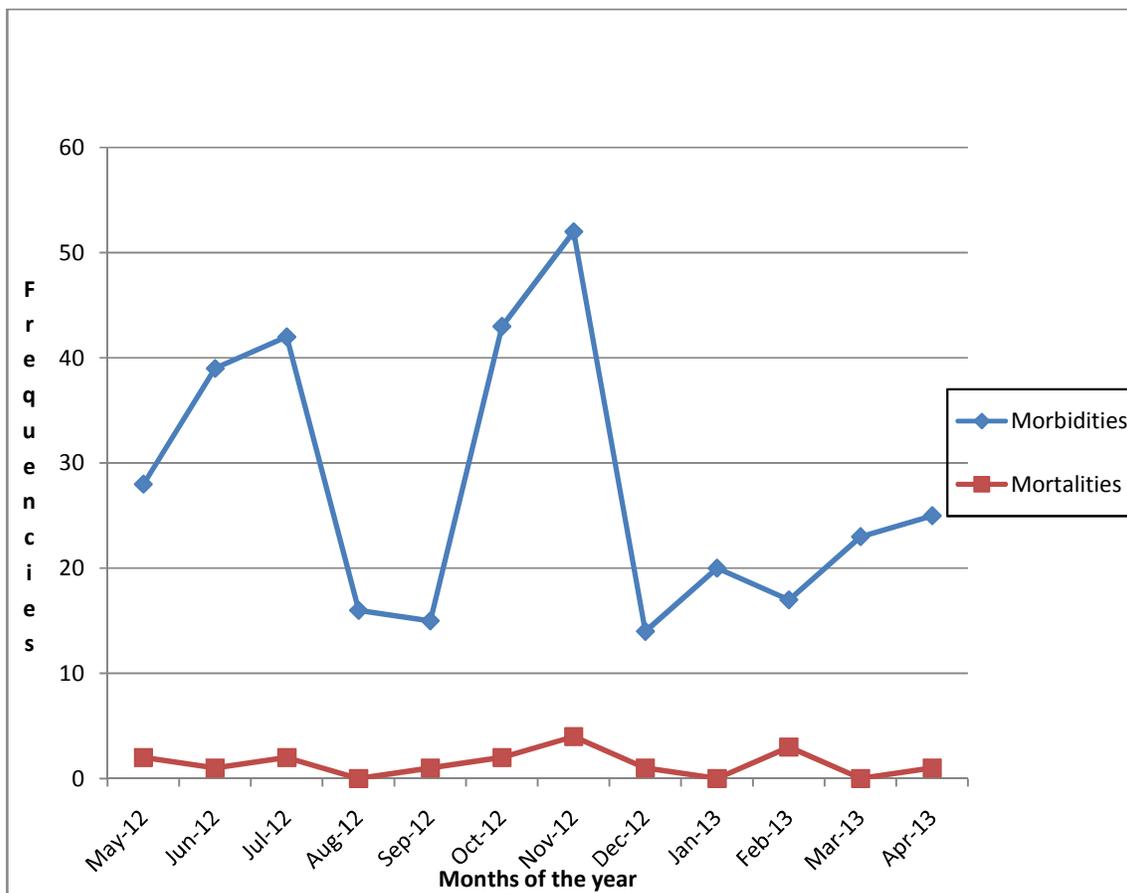


Fig. 1. Trend of paediatric morbidities and mortalities in Vom over one year

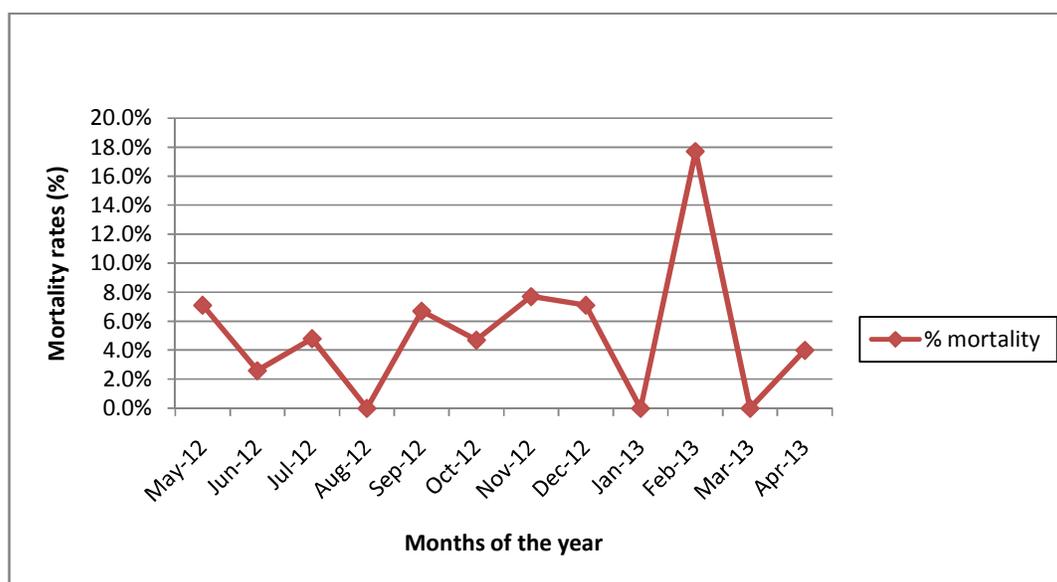


Fig. 2. Monthly paediatric mortality rates in Vom over one year

Table 1. Frequency of paediatric morbidities by age group in Vom

| Diagnosis | All patients No (%) | < 2 months No (%) | 2 months- < 5 years No (%) | ≥ 5 years No (%) |
|------------------------|------------------------|----------------------|-------------------------------|---------------------|
| Infections | 221 (66.2) | 26(46.4) | 141(78.8) | 54 (54.5) |
| Malaria | 102 (30.5) | 2 (3.6) | 69(38.6) | 31 (31.3) |
| Septicemia | 55 (16.5) | 24(42.9) | 27(15.1) | 4(4.0) |
| Acute bact. meningitis | 24 (7.2) | 0 (0) | 13(7.3) | 11(11.1) |
| Acute gastroenteritis | 20(6.0) | 0 (0) | 14 (7.8) | 6 (6.1) |
| Pneumonia | 18(5.4) | 0 (0) | 17 (9.5) | 1 (1.0) |
| Pulmonary tuberculosis | 2 (0.6) | 0 (0) | 1 (0.6) | 1 (1.0) |
| Non- infectious | | | | |
| Sickle cell disease: | 30(9.0) | 0(0.0) | 6(3.4) | 24(24.2) |
| Severe PEM | 4(1.2) | 0(0.0) | 4(2.2) | 0(0.0) |
| Perinatal | | | | |
| Perinatal asphyxia | 17(5.1) | 17(30.4) | 0 (0.0) | 0 (0.0) |
| Prematurity | 6 (1.8) | 6(10.7) | 0 (0.0) | 0 (0.0) |
| Neonatal jaundice | 3(0.9) | 3(5.4) | 0 (0.0) | 0 (0.0) |
| Others | 53(15.9) | 4 (7.1) | 28(15.6) | 21(21.2) |
| Total | 334(100) | 56(100) | 179(100) | 99(100) |

*Others includes: Poisonings, Nephrotic syndrome, near drowning, chronic liver disease, afebrile seizures, etc

** PEM – Protein energy malnutrition

Table 2. Causes of paediatric mortality and case fatality rates in Vom

| Diagnosis | Total no. of patients | Total no. of deaths (% of total mortalities) | Case fatality rates |
|------------------------|--------------------------|---|------------------------|
| Malaria | 102 | 6 (35.3) | 5.9 |
| Acute bact. meningitis | 24 | 4 (23.5) | 16.7 |
| Perinatal asphyxia | 17 | 2 (11.8) | 11.8 |
| Acute gastroenteritis | 20 | 2 (11.8) | 10.0 |
| Septicemia | 55 | 1 (5.9) | 1.8 |
| Prematurity | 6 | 1 (5.9) | 16.7 |
| Severe PEM | 4 | 1 (5.9) | 25.0 |
| Total : | | 17 (100) | |

*bact. – bacterial; ** PEM – Protein energy malnutrition

Table 3. Frequency of paediatric mortalities in Vom by diagnoses and age group

| Diagnosis | All patients No (%) | <2 months No (%) | 2 months- <5 years No (%) | ≥5 years No (%) |
|------------------------|--------------------------------|--------------------------------|---|----------------------------|
| Malaria | 6 (35.3) | 0 (0) | 6(50) | 0(0) |
| Acute bact. meningitis | 4(23.5) | 0 (0) | 2(16.7) | 2(100) |
| Perinatal asphyxia | 2(11.8) | 2 (66.7) | 0 (0) | 0(0) |
| Acute gastroenteritis | 2(11.8) | 0 (0) | 2(16.7) | 0(0) |
| Septicemia | 1(5.9) | 0 (0) | 1(8.3) | 0(0) |
| Prematurity | 1(5.9) | 1 (33.3) | 0(0) | 0(0) |
| Severe PEM | 1(5.9) | 0 (0) | 1(8.3) | 0(0) |
| Total | 17(100) | 3(100) | 12(100) | 2(100) |

*bact. – bacterial

** PEM – Protein energy malnutrition

4. DISCUSSION

The results of this study indicate that the burden of paediatric morbidity at the Vom Christian Hospital is in children less than 5 years of age, contributing to 70% of admissions. The situation appears to be similar not only in Nigeria but also in other developing countries with figures ranging from 66% to 90% of total paediatric admissions being children under five years of age [2–4,13,14]. These children are vulnerable and predisposed to various diseases. Their health status is widely recognized as an important indicator of the level of child health and overall development. The male: female ratio of children admitted was 1.3: 1. The male preponderance in terms of childhood admissions in the present study is similar to those in other studies [2,3]. This may be related to the increased biological vulnerability of males to infection or it may be a reflection of the demography of the population.

Overall in the present study, infections (including malaria, septicemia, acute gastroenteritis, pneumonia, meningitis) were the major reasons for admissions (66%), with malaria being the highest morbidity (31%). These findings are comparable to those of other studies in Nigeria and some African countries. Similar to the finding in this study Some authors also found malaria to be the most common reason for paediatric admissions accounting for 32% in Bayelsa State, [3] 44% in Benin, [2] 13% in Enugu [4] (all in Southern Nigeria), for 33% in Kenya [11] and 38% from Zaire [15]. These countries are endemic for malaria and may be an indication of inadequate control measures. This brings to question the impact of the malaria eradication programmes. With year 2015 just one year away, concerted efforts will need to be made in the control of malaria especially in rural/ sub-urban communities like ours. Some other studies from

some other developing countries even though also found infections to be the commonest morbidity, however, in contrast to our study, acute respiratory infections (ARIs) and acute gastroenteritis (AGE) were the major causes of morbidity [9,10,13,16]. The relatively low morbidity from acute respiratory infections in our study may also be a reflection of improved immunization in Nigeria, [17] which reduces susceptibility to ARIs. An improvement in the control of diarrhea disease programme [18] may also explain the relatively low prevalence of diarrhea in the current study. With regards to the various age groups, infections was still the main reason for admission in all the age groups, specifically with malaria being the most common morbidity in children aged 2 months to < 5 years and also in children > 5 years. This is similar to reports from other studies [3,19,20]. Although infections was also the main reason for admissions in children <2 months, however unlike in the former age groups, septicemia was the major morbidity (42.9%) with malaria contributing only 3.6 %. The low susceptibility of this age group to malaria and also the intermittent preventive prophylaxis against malaria during pregnancy may explain the low prevalence of malaria in this age group.

With regards to mortality, the overall paediatric mortality rate in the unit during the period was 5.1%. This is similar to reports from other authors from Nigeria and other developing countries; 6.5% reported by Mouneke [21] from Abaliki, 9% from Enugu, [4] 8.2% in Kenya, [11] 9.5% by Ayoola from Ibadan, [22] 6% Bucens from East Timor, [23] and 7.5% from Ethiopia [16]. Some other authors reported a higher rate of 12.6% from Sagamu [24]. Similar to the morbidities, there was a male preponderance in the mortalities, even though this was not statistically significant. Similar reasons can be adduced for

this finding, in addition to the fact that it may be a reflection of the male predominance of the admissions. Other authors have documented similar findings [21,24]. Furthermore, children under 5 years made up most of the mortalities (88%). Some authors have similarly documented a high mortality rate among children less than five years; 89.6% in Sagamu, [24] >80% in Benin, [2] 85% in Bayelsa, [3] and 85.2% from Port Harcourt [25]. A little differently, Chukwu [4] reported 58% from Enugu but excluded neonates; while Monueke [21] reported 97.2% from Abaliki inclusive of 5 year olds.

Malaria was the main cause of mortality in the current study (35.3%). This is similar to reports from other parts of the country where malaria was the major cause of mortality with figures ranging from 19.6% to 37.5% [2,3,21]. This indicates that malaria is still a major problem in our country and early recognition of symptoms, prompt diagnosis and early treatment may be useful in the reduction of these mortalities. Mothers should be taught to identify symptoms and to seek treatment early. The commencement of malaria management from the community via use of rapid diagnostic tests (RDTs) and artemisinin – based combination therapy (ACT) is also recommended. In contrast to our findings, Chukwu and colleagues from Enugu, reported malignancies as the main cause of mortality (20.4%), this was followed by other non – communicable diseases like renal and cardiac diseases; while malaria contributed to only 2.4% of the deaths [4]. The reason for this difference can be explained by the fact that the Enugu study included only children in the main wards, excluding the emergency units. Also, the fact that it is a tertiary referral centre may explain the high mortalities from non-communicable diseases probably from referred cases.

Even though malaria was the main cause of mortality in our study, its case fatality rate was low (5.9%). Severe protein energy malnutrition (PEM) had the highest case fatality rate of 25%. This was followed by acute bacterial meningitis and prematurity, 16.7%. Duru and colleagues from Bayelsa reported PEM to have a case fatality rate of 22.9 which was the 2nd highest medical CFR [3]. In the Enugu report, tetanus had the highest CFR of 67%, followed by HIV/AIDS, 27% and malignancies, 24% [4]. The CFR for severe PEM was however low, 9.6% in their report. In another report from Zimbabwe, [10] severe PEM had a similar CFR 28.7%, to that of the current study. It is therefore necessary

that PEM should be screened for and treated early to prevent this high CFR. Similarly, preventive measures against meningitis including immunization should be encouraged in view of its relatively high CFR. Thus the recent inclusion of the *Haemophilus influenzae* type b vaccine into the routine immunization schedule in Nigeria is a welcome development [17,26]. This should also be expanded to include the pneumococcal vaccine. Furthermore, immunization against meningococcal meningitis should be conducted regularly, especially in the older children. With regard to prematurity, the risk factors for prematurity in our environment include premature rupture of membranes, antepartum haemorrhage, previous preterm deliveries, pregnancy induced hypertension, etc [27,28]. Thus strategies that may reduce prematurity include identification and management of high risk pregnancies and a good referral system, while improving neonatal facilities and care may reduce the CFR from prematurity.

5. CONCLUSION

In conclusion, children less than five years of age bear the greater burden of paediatric morbidity and mortality in Vom Christian Hospital, Jos, Nigeria. Infections in general, with malaria in particular, are the major cause of morbidity and mortality in the hospital.

The main limitation of this study is the short duration of review, one year. The findings are however relevant as a preliminary report that will help in planning and will also serve as a baseline for subsequent reviews.

We recommend a refocus on health programmes like child survival strategies and integrated management of childhood illness (IMCI) targeted especially towards children less than five years. Prevention of infections via hygienic health habits is also encouraged. In addition, malaria eradication programmes should be intensified with diversification of methods and outreaches to the surrounding communities that the hospital serves. Furthermore, Mothers should be taught to identify signs of illness and seek treatment early. Finally, use of RDTs and ACTs in the community, at the primary health care (PHC) level will facilitate early diagnosis and treatment of malaria.

CONSENT

Not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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