NIGERIAN JOURNAL OF PAEDIATRICS

https://www.njpaediatrics.com

PRINT: ISSN 0302-4660

ONLINE: ISSN 2814-2985

OFFICIAL JOURNAL
OF THE PAEDIATRIC
ASSOCIATION OF
NIGERIA

VOLUME 52
NUMBER 1
JANUARY – MARCH 2025

ORIGINAL RESEARCH

Nigerian Journal of Paediatrics 2024; Volume 52(1): 12-21.
https://dx.doi.org/10.63270/njp.v52i1.2000003

Pattern of Diseases and Outcome of Hospitalization Among Children at the Rivers State University Teaching Hospital, Port Harcourt, Nigeria

Wonodi Woroma[1,2], West Boma A[1,2]

[1]Department of Paediatrics, Rivers State University Teaching Hospital, Nigeria.
[2]Department of Paediatrics and Child Health, Faculty of Clinical Sciences, College of Medical Sciences, Rivers State University, Nkpolu-Oroworukwo, Port Harcourt, Nigeria.

Correspondence
Dr Woroma Wonodi, Department of Paediatrics, Rivers State University Teaching Hospital, Nigeria/ Department of Paediatrics and Child Health, Faculty of Clinical Sciences, College of Medical Sciences, Rivers State University, Nkpolu-Oroworukwo, Port Harcourt, Nigeria. Email: woroma.wonodi@ust.edu.ng ;
ORCID – https://orcid.org/0000-0003-0198-7233.

Abstract

Background: Periodic evaluation of the pattern of disease and outcome among hospitalized children is important in auditing the quality and effectiveness of health care systems.

Objective: To describe the pattern of diseases and outcome of hospitalized children in a Nigerian facility.

Methods: This was a retrospective study carried out at the Children's Medical Ward of the Rivers State University Teaching Hospital, Nigeria, over five years, from the 1st of January 2017 to the 31st of December 2021. The ward records of all hospitalized children aged one month to 16 years were reviewed and analysed. Neonatal and surgical cases were excluded.

Results: Of the 2213 patients studied, males predominated in a ratio of 1.5:1, with the majority of the children aged below five years. The mean age was 20.7±3.7 months. Most admissions were recorded during the rainy season and were mainly due to communicable diseases, especially malaria, tonsillitis and bronchopneumonia. Non-communicable diseases were mostly acyanotic congenital heart disease, seizures, cerebral palsy and cancers. The majority of the children were discharged home, while 0.4% were referred to other facilities for further care. The mortality rate was 3.8%, and this was mainly due to malaria, bronchopneumonia, and meningitis.

Conclusion: The morbidity and mortality pattern in hospitalized children with non-surgical conditions is mostly due to preventable communicable diseases. Increased health funding by the government, improved socioeconomic status, health education, immunisation, and sanitation could reduce the morbidity and mortality from these communicable diseases.

Key words: Children, Communicable diseases, Malaria, Pneumonia, Mortality, Nigeria.

Introduction

The evaluation of the pattern of childhood admissions is important for auditing the performance of hospital services and helps in health care planning and proper allocation of resources.[1, 2] The pattern of diseases in children varies with sex, age and from regions to regions. The knowledge of the pattern of diseases helps identify common childhood illnesses with the potentials to lead to morbidity and mortality.

Children aged less than five years are vulnerable to and die mainly from infectious diseases such as malaria, pneumonia, diarrhoea, Human Immunodeficiency Virus (HIV) and tuberculosis.[3] This is attributed to their reduced immunity and the lack of or incomplete immunisations. There is a decline in

communicable diseases in older children who are more predisposed to non-communicable diseases, trauma and conflict.[4, 5] This may be attributed to their significant physical activity, poor judgement and supervision.[4, 5] This age group is also more likely to be victims of some social ills such as molestation and rape.[5] Various studies in Nigeria and other African nations have documented communicable diseases as the predominant cause of morbidity and mortality in children,[6-18] with the mortality rate in Sub-Saharan Africa being remarkably high.[3,11] Otaigbe and Ugwu[6] in 2007 reported the most common communicable diseases among hospitalized children at the University of Port Harcourt Teaching Hospital(UPTH) as malaria, lower respiratory tract infections, and diarrhoea. Another retrospective study carried out more than a decade ago in Port Harcourt,[1] South-south Nigeria reported a mortality of 2.8% with HIV/AIDS and bronchopneumonia as the commonest causes of mortality while in Ondo State, southwest Nigeria[15] malaria was the commonest cause of mortality. A 10-year retrospective study in Accra, Ghana,[16] also documented malnutrition and septicaemia as the commonest causes.

Childhood mortality is a reflection of a country's development and its health care delivery system.[10] It is also an important indicator of the socioeconomic development and quality of life of its citizenry. Although there has been a decline in the under-five mortality rate globally, the mortality rate in sub-Saharan Africa has remained the highest, with one child in 13 dying before their fifth birthday. In contrast, globally, one in 27 children die before age five.[3,11] This contrasts findings in the developed countries where only 2% die before their fifth birthday.[3,4] In the year 2019, half of all the global under-five deaths occurred in only five countries, of which Nigeria was one.[3] It was also observed that Nigeria and India contributed a third of all the deaths.[3]

It is pertinent to note that the diseases associated with childhood morbidity and mortality can be prevented or treated with simple, affordable measures such as immunisation, adequate nutrition, safe water and food, and the availability of quality health care.[3] The mortality rate in older children above five years is remarkably much less. This is attributed to the decline in the burden of infectious diseases with increasing age.[3] In Nigeria, according to the Demographic and Health Survey 2018, the infant mortality rate reduced from 75 per 1000 live births to 67 per 1000 live births, while the under-five mortality rate reduced from 157 per 1000 live births to 132 per 1000 live births.[3] These figures are still unacceptably high despite all the preventive programmes that have been put in place to reduce these morbidities and mortalities.

Although there is a global reduction in child survival rate, especially in the under-five age group, there is still an urgent need to further improve child survival, especially in our sub-region. Disease patterns may vary over time. No reported audit has been carried out in the children's ward of the Rivers State University Teaching Hospital since its inception; thus, the present study was done to determine the pattern of disease and outcome of children admitted over five years. The findings from this study may help in policy-making, further strengthening the health system and improving child survival. The study aimed to determine the pattern of diseases and outcome of hospitalization among children at the Rivers State University Teaching Hospital (RSUTH), Nigeria.

Methods

This was a five-year, cross-sectional, retrospective study of children hospitalized at the Children's Medical Ward of the RSUTH, Port Harcourt, Nigeria, between the 1st of January 2017 and the 31st of December 2021. The RSUTH is a 375-bed tertiary health facility that serves as a referral centre for private hospitals, primary health care centres, secondary health facilities, tertiary health facilities located within and outside Rivers

State, as well as self-referred patients. The Paediatrics Department of RSUTH is manned by Consultant Paediatricians, resident doctors, medical interns, nurses and other support staff.

Ethical approval for this study was obtained from the Rivers State Hospitals Management Board. Confidentiality was maintained over the data of the children studied. The data were retrieved from the ward's admission records for analysis. The data obtained about each child's records included the sex, age, date, month and year of admission, diagnosis, duration/length of hospital stay and outcome. The outcome of hospitalization were classified as discharged, absconded, discharged against medical advice, died or referred to other facilities.

The data were analysed using the Statistical Package for Social Sciences (SPSS) version 25. The results were presented as frequency tables, percentages and figures. The Chi-Square test was used to assess associations. *P*-values less than 0.05 was considered significant.

Results

Characteristics of the study population

Out of the 2288 children admitted, 2213 (96.7%) had complete data and were analysed. Males predominated with 1322 (59.7%) and male-to-female ratio of 1.5:1. The majority of children admitted belonged to the age group 12-60 months (967; 43.7%) with a mean age of 20.71±3.743 months. Most of the children were admitted during the rainy season (1185; 53.5%). The length of stay for most of the children in the ward was 0-7 days (1658; 75.8%), with the mean length of stay of 4.615± 2.226 days as shown in Table I.

Table I: Characteristics of the study population

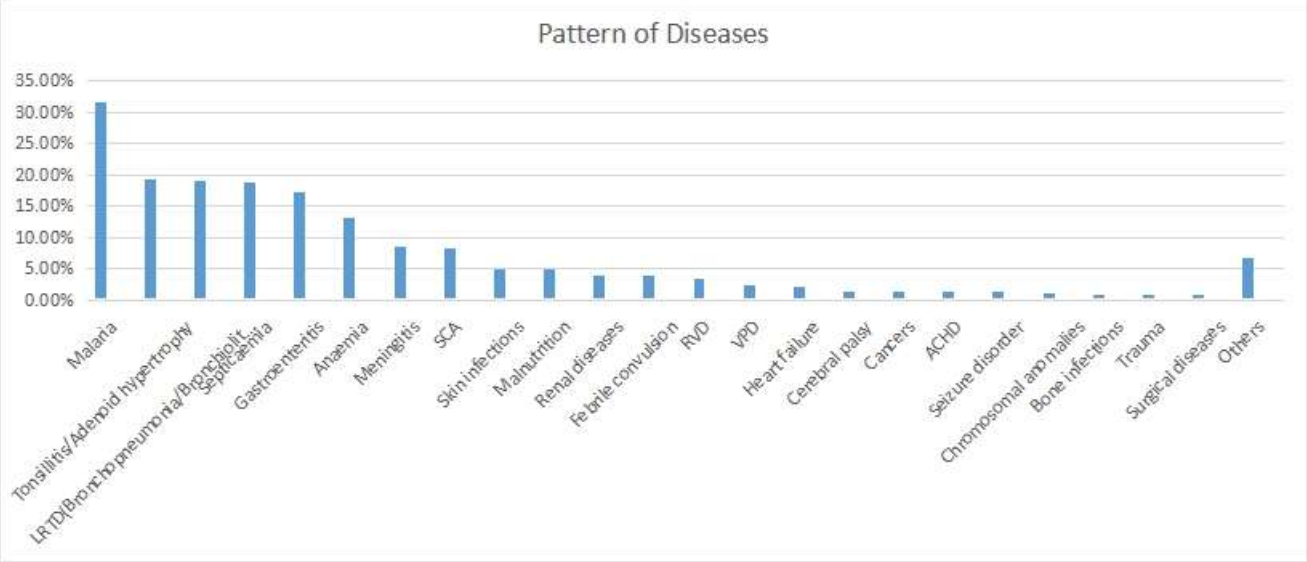
Variable		***Frequency***	***Percentage***
Sex	Male	1322	(59.7)
	Female	891	(40.3)
Age (months)	1 - 11	705	(31.9)
	12 - 60	967	(43.7)
	>60	541	(24.4)
Season	Rainy season	1185	(53.5)
	Dry season	1028	(46.5)
Duration of stay (days)	0 – 7	1658	(74.9)
	8 – 14	390	(17.6)
	>14	165	(7.5)

Distribution of disease type

Most of the diseases diagnosed among the children were communicable (2946; 74.0%), while the least common cases were non-communicable conditions (1040; 26.0%).

Pattern of disease

The commonest disease observed among children admitted was malaria (705; 31.7%), followed by tonsillitis/adenoid hypertrophy (432; 19.4%), lower respiratory tract diseases (bronchopneumonia/bronchiolitis (432; 19.0%), septicaemia (419; 18.8%) and gastroenteritis (387; 17.4%) as shown in Figure 1.



SCA-Sickle cell anaemia, RVD-Retroviral disease, VPD-Vaccine preventable diseases, ACHD-Acyanotic congenital heart disease, LRTD - lower respiratory tract disorders.

Figure 1: Pattern of diseases among hospitalized children

Pattern of diseases distributed according to sex

Anaemia and cancers were significantly more frequent in males than in females while acyanotic congenital heart diseases (ACHD) was significantly more frequent in females than in males (P <0.05) as shown in Table II.

Table II: Pattern of disease distribution according to sex

Condition	***Sex***		
	Male, n (%)	**Female, n (%)**	**X^2, p**
Malaria	407 (30.8)	287 (32.2)	0.502, 0.479
Tonsilitis/Adenoidal hypertrophy	265 (20.0)	163 (18.3)	1.047, 0.306
Lower Respiratory Disorders	249 (18.8)	172 (19.3)	0.076, 0.783
Septicaemia	253 (19.1)	165 (18.5)	0.133, 0.715
Gastroenteritis	228 (17.2)	154 (17.3)	0.001, 0.982
Anaemia	190 (14.4)	101 (11.3)	4.297, 0.038
Meningitis	123 (9.3)	71 (8.0)	1.187, 0.276
Sickle Cell Anaemia	115 (8.7)	72 (8.1)	0.263, 0.608
Skin disorders	67 (5.1)	47 (5.3)	0.047, 0.829
Malnutrition	59 (4.5)	53 (5.9)	2.444, 0.118
Renal diseases	44 (3.3)	44 (4.9)	3.613, 0.051
Retroviral Disease	39 (3.0)	37 (4.2)	2.321, 0.128
Febrile convulsion	34 (2.6)	24 (2.7)	0.031, 0.860
Vaccine-Preventable Diseases	29 (2.2)	25 (2.8)	0.838, 0.360
Heart failure	33 (2.5)	17 (1.9)	0.834, 0.361
Cerebral palsy	24 (1.8)	8 (0.9)	3.145, 0.076
Cancers	26 (2.0)	6 (0.7)	6.247, 0.012
Acyanotic Congenital Heart Diseases	11 (0.8)	19 (2.1)	6.730, 0.009

The cases of febrile convulsions were secondary to malaria (27), tonsillitis (17), bronchopneumonia (9), otitis media (3) and varicella (2). The identified causes of anaemia included septicaemia (120), malaria (87), sickle cell disease (53), bronchopneumonia (24),

chronic renal failure (5) and post-traumatic haemorrhage (2). The identified cancers included retinoblastoma (11), lymphomas (5), acute lymphoblastic leukaemia (ALL) (5), rhabdomyosarcoma (4), neuroblastoma (3), nasopharyngeal carcinoma (2) and nephroblastoma (2). Heart failure was attributed to bronchopneumonia (20), severe anaemia (20) and congenital heart diseases (10).

Pattern of disease according to age distribution

Bronchopneumonia, septicaemia, gastroenteritis, skin infections, malnutrition and acyanotic congenital heart diseases occurred significantly more frequently in the age group 1-11 months. On the other hand, malaria, tonsillitis and febrile convulsion significantly more frequently among children aged 12-60 months. Anaemia, meningitis, sickle cell anaemia, renal diseases, retroviral diseases and cancers were significantly more frequent among children that were aged > 60months ($P < 0.05$) as shown in Table III.

Table III: Pattern of disease distribution according to age

Conditions	***Age (months)***			***X^2, p***
	1-11, n (%)	**12-60, n (%)**	**>60, n (%)**	
	(n = 1239)	**(n = 1591)**	**(n = 825)**	
Malaria	184 (26.1)	364 (37.6)	148 (27.4)	30.765, <0.001
Upper Respiratory Diseases	93 (13.2)	293 (30.3)	42 (7.8)	138.022, <0.001
Lower Respiratory Diseases	244 (34.6)	136 (14.1)	35 (6.5)	183.876, <0.001
Septicaemia	197 (27.9)	145 (15.0)	73 (13.5)	57.868, <0.001
Gastroenteritis	172 (24.4)	168 (17.4)	41 (7.6)	60.782, <0.001
Anaemia	81 (11.5)	123 (12.7)	90 (16.6)	7.514, 0.023
Meningitis	42 (6.0)	64 (6.6)	88 (16.3)	50.580, <0.001
Sickle Cell Anaemia	11 (1.6)	55 (5.7)	121 (22.4)	188.224, <0.001
Skin disorders	44 (6.2)	37 (3.8)	33 (6.1)	6.185, 0.045
Malnutrition	53 (7.5)	47 (4.9)	10 (1.8)	20.873, <0.001
Renal diseases	6 (0.9)	34 (3.5)	49 (9.1)	54.542, <0.001
Retroviral disease	33 (4.7)	14 (1.4)	29 (5.4)	20.863, <0.001
Febrile convulsion	15 (2.1)	40 (4.1)	2 (0.4)	FE<0.001
Vaccine-Preventable Diseases	17 (2.4)	19 (2.0)	18 (3.3)	2.708, 0.258
Heart failure	20 (2.8)	15 (1.6)	15 (2.8)	3.906, <0.142)
Cerebral palsy	6 (0.9)	14 (1.4)	13 (2.4)	5.041, 0.080
Cancers	2 (0.3)	14 (1.4)	17 (3.1)	FE, <0.001
Acyanotic Congenital Heart Diseases	19 (2.7)	9 (0.9)	1 (0.2)	FE, <0.001

Upper respiratory diseases - Tonsillitis/Adenoid hypertrophy
Lower respiratory diseases - Bronchopneumonia/Bronchiolitis

Pattern of disease according to time of admission (seasonal variation)

Table IV shows tonsillitis/adenoid hypertrophy were significantly more frequent in the dry season than the rainy season ($P = 0.003$), whereas meningitis was more frequent in the rainy season ($P < 0.001$).

Outcome of patients

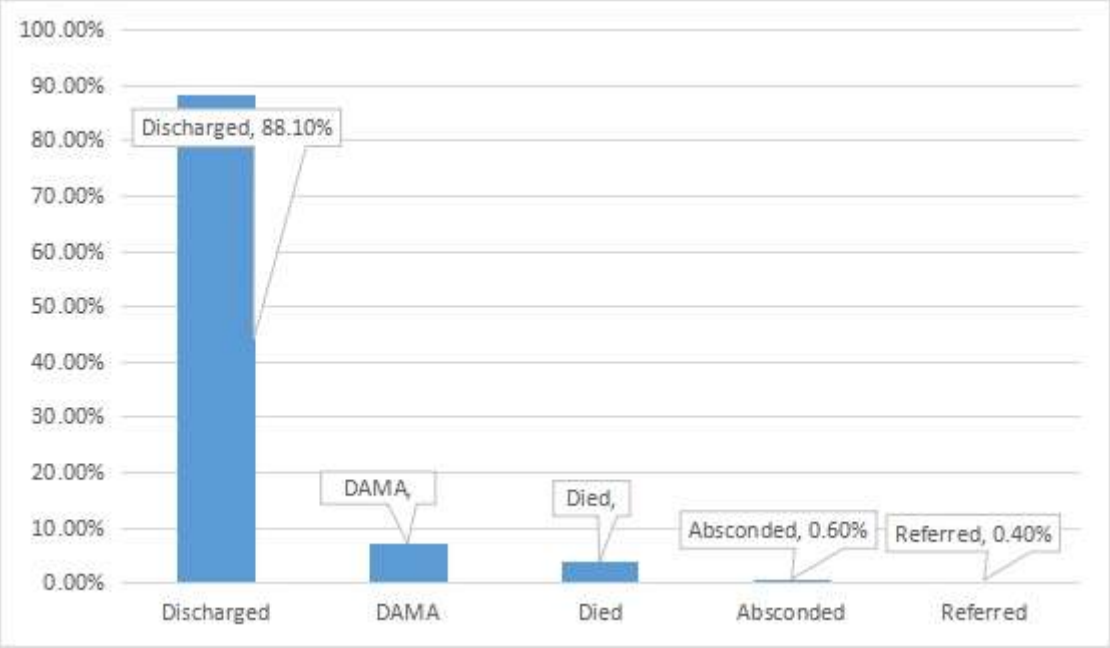
Out of 2213 hospitalized children, 1950 (88.1%) were discharged home while 83 (3.8%) died. Out of the 2946 cases of communicable diseases, there were 116 (3.9%) mortalities, while the proportion of deaths among children with non-communicable diseases was 29/1040 (2.7%) as shown in Figure 2.

Mortality pattern of disease by age group

Mortalities in children with malaria, bronchopneumonia and meningitis were significantly associated with age group (P = 0.048, 0.022, 0.047) as shown in Table V.

Table IV: Pattern of disease distribution according to time of admission (seasonal variation)

Conditions	***Season***		***X^2, p***
	Rainy, n (%)	**Dry, n (%)**	
	(n = 1905)	**(n = 1753)**	
Malaria	358 (30.2)	347 (33.1)	2.165, 0.141
Upper Respiratory Diseases	202 (17.0)	230 (21.9)	8.558, 0.003
Lower Respiratory Diseases	242 (20.4)	182 (17.4)	3.375, 0.066
Septicaemia	212 (17.9)	207 (19.8)	1.264, 0.261
Gastroenteritis	174 (14.7)	213 (20.3)	12.352, <0.001
Anaemia	156 (13.2)	139 (13.3)	0.005, 0.945
Meningitis	130 (11.0)	64 (6.1)	16.583, <0.001
Sickle Cell Anaemia	108 (9.1)	80 (7.6)	1.581, 0.209
Skin infections	53 (4.5)	61 (5.8)	2.086, 0.149
Malnutrition	57 (4.8)	55 (5.2)	0.224, 0.636
Renal diseases	55 (4.6)	34 (3.2)	2.837, 0.092
Retroviral disease	40 (3.4)	36 (3.4)	0.006, 0.938
Febrile convulsion	33 (2.8)	25 (2.4)	0.351, 0.554
Vaccine-Preventable Diseases	25 (2.1)	29 (2.8)	1.019, 0.313
Heart failure	27 (2.3)	23 (2.2)	0.018, 0.894
Cerebral palsy	19 (1.6)	14 (1.3)	0.273, 0.601
Cancers	14 (1.2)	14 (1.3)	0.107, 0.743



DAMA-Discharged against medical advice

Figure 2: Outcome of Patients

Case fatality rates (CFR) in some conditions

Table VI shows that the highest CFR was recorded in burn injuries (25.0%), VPD (16.0%) and bleeding disorders (11.0%), while the least occurred in malaria (4.0%), septicaemia (4.0%) and bronchopneumonia (4.0%).

Table V: Mortality rates in disease conditions according to age groups

Conditions	***Age group (months)***			***p***
	1-11, n (%)	**12-60, n (%)**	**>60, n (%)**	
Malaria	5 (21.7)	14 (51.9)	9 (27.3)	0.048
Septicaemia	7 (30.4)	7 (25.9)	3 (9.1)	0.104
Bronchopneumonia	8 (34.8)	2 (7.4)	3 (9.1)	0.022
Bronchiolitis	2 (8.7)	2 (7.4)	2 (6.1)	1.000
Meningitis	0 (0.0)	4 (14.8)	8 (24.2)	0.047
Retroviral disease	6 (26.1)	1 (3.7)	5 (15.2)	0.074
Skin disorders	4 (17.4)	2 (7.4)	2 (6.1)	0.367
Vaccine-Preventable Diseases	4 (17.4)	1 (3.7)	1 (3.0)	0.106
Cancers	0 (0.0)	2 (7.4)	3 (9.1)	0.435

Table VI: Case fatality rates in some disease conditions

Condition	***Number of deaths***	***Total number of cases***	***Case Fatality Rate (%)***
Malaria	28	705	4.0
Septicaemia	17	419	4.0
Bronchopneumonia	13	367	4.0
Meningitis	12	193	6.0
Retroviral Disease	12	76	16.0
Gastroenteritis	8	387	2.0
Skin disorders	8	114	7.0
Malnutrition	6	112	5.0
Vaccine-Preventable Diseases	6	54	11.0
Bronchiolitis	6	96	6.0
Burns	1	4	25.0
Asthma	1	12	8.0
Acute Stroke syndrome	1	8	12.5
Bleeding disorder	1	11	9.0

Discussion

The male predominance among children admitted into our medical ward is similar to previous studies in other centres. [1,5-7,12-18] The reason for this may not be unrelated to the biological vulnerability to infections of the male sex. Another reason may be cultural, where males are preferred and hence more likely to be brought to the hospital for treatment to ensure their survival, unlike their female counterparts. Further studies may be needed on sex preference.

Most of the children in this study were under-five years old. This is similar to reports from other studies within [1,7,17,18] and outside Nigeria, [5, 13, 16] and may be due to the reduced immunity occasioned by their young age, with an increased vulnerability to disease.

In this study, the majority of admissions occurred during the rainy season. This finding was similar to the report in previous studies in Port Harcourt by George *et al.* [1] and Otaigbe *et al.* [6] and in Benin City by Onyiriuka.[18] The rainy season usually extends from March to

September, especially in Southern Nigeria. The heavy downpour causes an accumulation of stagnant water in drains and gutters, which is important in breeding mosquitoes and causing malaria. From this study and others, the burden of malaria is significant, being the major illness diagnosed as well as the commonest cause of mortality. The chilling and high humidity arising from the rains also encourage the growth of many disease-causing micro-organisms. In addition, contamination of water sources easily occurs during the rainy season, leading to diarrhoea and other water-borne diseases.

Disease type distribution shows communicable diseases are still more prevalent, as reported in studies in Nigeria [1,6,7,12,15,17,18] Kenya,[5] Ethiopia [13,14] and the West Indies.[2] Underdevelopment of these third world countries, the prevalent poor environmental sanitation, lack of infrastructure, poor health-seeking behaviour, and lack of or insufficient immunisation may play key roles in the dominance of these infectious diseases. This finding differs from what currently occurs in more developed nations in the 20th century, where the introduction and utilisation of various vaccines, antibiotic agents, improved hygienic practices as well as a better understanding of the role of nutrition in preventing illnesses and maintaining health has led to a reduction in communicable diseases.[19] Non-communicable diseases like congenital disease, trauma, behavioural, developmental and psychological disorders now predominate in developed countries.[19]

The predominant diseases in the under-five group in the present study were communicable and these included malaria, tonsillitis/adenoidal hypertrophy, bronchopneumonia, septicaemia and gastroenteritis. On the other hand, the non-communicable diseases such as renal diseases, sickle cell anaemia and cancers were commoner in children above the age of five years. This is similar to the findings in other studies.[6,7,17] Although the proper use of insecticide-treated nets is an effective method of curbing malaria in malaria-endemic regions like Nigeria, many factors mitigate against its use, such as the heat from the net, fear of the chemicals used in the nets, ignorance, cultural beliefs, difficulty in hanging the nets as well as preference for other methods of prevention of malaria like the use of insecticide sprays, and mosquito coils.[20] These nets are sometimes used for fishing or to cover plants to prevent insect access. Continuous education on the proper use of insecticide-treated nets, environmental sanitation, and more funding for the health sector may play a significant role in reducing infectious diseases.

In children older than five years, the preponderance of non-communicable diseases such as sickle cell anaemia, renal disease and cancers over infectious diseases in the present study is similar to other Nigerian studies such as in Port Harcourt [1] and Gusau.[12] Previous studies in UPTH had shown HIV /AIDS as a significant reason for childhood admission and mortality, [1] contrary to the finding in this report. The fact that HIV/AIDS did not feature significantly in the present study could be attributed to the increased campaign on HIV prevention, treatment and management. In another study conducted in Kenya, malaria was not a significant reason for admission, most probably because it was carried out during the peak of antimalarial campaigns in that locality.[5]

The majority of the children studied were discharged, similar to reports from other studies.[1,14,17,18] The availability of specialist paediatric services promoting early, quality and appropriate health care could have played a key role. There was a high rate of DAMA (7.1%) in this report, much higher than 1.9% reported in Gusau [12] and 1.2% in Abakaliki.[18] The reasons for DAMA may be financial, religious, caregiver burnout, slow clinical progress in the child, desire to try unorthodox methods or dissatisfaction with the health care system. However, the data from this study was not adequate to ascertain the exact reasons for the trend of DAMA. In this study, only 0.4% of patients were referred out of the hospital to

other facilities, similar to reports from the specialist hospital in Gusau, northern Nigeria, [12] where only about 0.6% of the admitted patients were referred out. The low referral rate could be attributed to the presence of different specialists who are able to manage these patients effectively.

Limitations of the study

This retrospective, single centre, hospital-based study was prone to incomplete documentation and may not represent the exact prevalence of disease entities in the community.

Conclusion

The morbidity and mortality pattern in children admitted to the children's medical ward of RSUTH is similar to other studies and primarily due to preventable communicable diseases. Most of these were discharged after receiving care from the facility.

Increased government investment in health, improvement in socioeconomic status, health education, immunisation and sanitation could reduce the morbidity from infectious diseases.

Acknowledgement: The authors acknowledge the nurses and records department in the hospital for support during data collection.

Authors' Contributions: WW conceived and designed the study and reviewed the literature. WBA participated in the literature review and data analysis. Both authors drafted the manuscript and revised it for sound intellectual content. Both authors approved the final version of the manuscript.

Conflicts of Interest: None declared.

Financial support: The authors received no funding for the research and publication of this article.

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