



Childhood Non Communicable Diseases (NCDs) in Two Tertiary Hospitals in South-South Nigeria

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Background: As in adults, there is a high burden of non-communicable diseases (NCDs) in children and this is often associated with a high mortality rate, however, little emphasis is being paid to NCDs in children.

Objective: The objective of this study was to determine the burden, pattern and mortality associated with NCD among children admitted into the Paediatric wards of two tertiary centres in South-South Nigeria.

Methods: This was a retrospective study carried out in two tertiary hospitals in South-South Nigeria. Medical/admission records of all patients with Non communicable diseases (NCDs) were retrieved. Information obtained included patient's age, sex, date of admission, final diagnosis, date of discharge and hospital outcome. Total number of admissions and deaths within the study period were also obtained. The diagnoses were classified according to pathologic and systematic derangement. Obtained data were analysed using Statistical Package for Social Sciences (SPSS) version 20.0 and presented in frequency tables and charts while chi square and Fischers exact test were used to compare categorical variables. Statistical significance was set at $P < 0.05$.

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Results: A total of 4,167 patients were hospitalized over the study period, out of which 897 had NCDs giving a prevalence rate of 21.52%. Of the NCDs, 570 (63.55%) were males while 327 (36.45%) were females giving a male female ratio of 1.74:1. Haematology, Oncology (Cancers), Nephrology, Neurology and Cardiology disorders were the five common NCDs and constituted about three quarte (74.47%) of all NCDs. Among the five common NCDs, haematology, oncology and nephrology disorders were commoner in the older children while cardiac, and neurologic disorders were more prevalent in younger children. This distribution was not statistically significant ($X^2 = 1.67$, $p = 0.9800$). Sickle cell anaemia (SCA) was the prevalent Haematological disease constituting 176 (95.1%) of all haematological cases. Acute lymphoblastic leukaemia, Nephrotic syndrome, Seizure disorder and Ventricular septal defect were the prevalent cancers, Nephrology, neurology and cardiac disorders and constituted 50 (27.6%), 39 (28.7%), 33 (40.74%), 21 (25.0), of the diseases respectively. A total of 112 deaths occurred in the Paediatric wards over the study period, 35 (31.25%) of these deaths were caused by NCDs and patients with Cancers constituted 60% (21/35) of all deaths. More deaths occurred among the adolescents; however, this was not statistically significant. (chi square = 21.99, $p=0.1081$).

Conclusion: There is a high burden and high mortality of NCDs in children in our environment. The common pattern of NCDs were Haematology, Oncology (Cancers), Nephrology, Neurology and cardiology diseases. Improved health education, early cancer screening and availability of cancer and prenatal diagnosis of SCA screening tools, premarital genotype counselling and screening and legislation to support families with NCDs is advocated.

Keywords: Non communicable diseases; mortality rate; chronic respiratory diseases.

1. INTRODUCTION

A non-communicable disease (NCD) is a medical condition or disease which is non-infectious and non-transmissible among people. For many years, infectious or communicable diseases were the major causes of death around the world and uncontrolled epidemics of infectious diseases limited life expectancy. With the advent of antibiotics, vaccinations and improvement in life conditions following advances in medical research after the second world war, there was an increased incidence of Non-communicable diseases (NCDs) as a cause of death in industrialised countries. Presently, the global burden of diseases is undergoing a rapid epidemiological transition shifting from infectious to NCDs [1] and NCDs are increasing rapidly in both developing and developed countries [2]. About ten years ago, it was predicted that by 2020, NCDs will account for 80 percent of the global burden of disease, causing seven out of every 10 deaths in developing countries, compared with less than half as at then [3,4].

Globally, NCDs are associated with the elderly, but evidence shows that children and adults are also having the diseases but with differing aetiology [5–7]. A great emphasis has been laid on NCDs in adults with little emphasis in children. Among adults, NCDs are globally responsible for more deaths than all other

diseases combined, with four NCDs (cardiovascular disease [CVD], cancer, chronic respiratory diseases [CRD] and diabetes) responsible for 84% of this mortality [8]. Almost three quarters of these deaths from NCDs occur in low-middle income countries (LMICs) that already experience challenges in managing significant pandemic of infectious disease such as HIV/AIDS and tuberculosis (TB). With many LMICs undergoing rapid epidemiological transition, the emergence of NCDs as a major disease burden and cause of death have the potential to overwhelm their health systems with a double burden of disease [9].

In children, Emodi, et al. [10] reported haematological diseases, malignancies and renal disorders as the top three common NCDs in children in South East Nigeria and the same finding was reported by Otaigbe, et al. [11] in Port Harcourt. This finding is at variance with findings in the adult population in the same centre, Port Harcourt as reported by Unachukwu, et al. [12] where hypertension (35.7%), diabetes (19.5%) and chronic respiratory conditions (16.5%) were the leading NCDs [12]. This, therefore, emphasizes the fact that age group-specific NCD patterns should be determined in order to focus on its prevention, especially in resource-limited countries where treatment modalities are often very expensive and may not be readily available. This study is aimed at determining the burden of NCD among children

admitted in the Paediatric wards of two tertiary centres in South-South Nigeria. It will also determine the pattern or changing pattern of NCDs if any and the mortality associated with them.

2. METHODOLOGY

This was a retrospective study of children admitted into the Paediatric wards of two tertiary hospitals in South-South Nigeria - the University of Port Harcourt Teaching Hospital (UPTH), Port Harcourt and the Niger Delta University Teaching Hospital (NDUTH), Okolobiri, Bayelsa state, from January 2015 to December 2019. Both hospitals serve as tertiary referral centres for inhabitants of Rivers, Abia, Imo, Bayelsa and Delta states. Ethical approval for the study was obtained from the Ethics and Research committee of the NDUTH while permission was obtained from the Head of Paediatric Department of UPTH. Admissions into the Paediatric wards are usually from the children outpatient clinic (CHOP), Consultant Paediatric clinics (CPC), Children emergency wards (CHEW) or transferred from the Paediatric surgical wards of the hospitals. Medical records/admission records of all the patients with Non communicable diseases (NCDs) were retrieved. Information obtained from the records included patient's age, sex, date of admission, final diagnosis, date of discharge and hospital outcome. Total number of admissions and deaths within the study period were also obtained. The diagnoses were verified from the final discharge diagnoses, which were entered centrally in the central medical record of the hospital or in the case notes. The diagnosis of each disease entity was made clinically and

confirmed by laboratory investigations. There was a 100% concordance between the final diagnosis and that recorded in the central medical record. The diagnoses were classified according to pathologic and systematic derangement. Obtained data were analysed using Statistical Package for the Social Sciences software (SPSS version 20.0, Chicago IL, USA) and presented in frequency tables and charts while chi square and Fischers exact test was used to compare categorical variables. Statistical significance was set at $P < 0.05$.

3. RESULTS

3.1 Demographic Characteristics of the Study Population and Prevalence of NCDs

A total of 4,167 patients were hospitalized over the study period, out of which 897 had NCDs giving a prevalence rate of 21.52%. Of the NCDs, 570 (63.55%) were males while 327 (36.45%) were females giving a male female ratio of 1.74:1. The children were aged from 2 weeks to 18 years (0.5–216 months) with a mean age of 72.09 ± 61.7 months. Two hundred and forty-nine (27.76%) were infants while 251 (27.98%) were adolescents Table 1.

Pattern of NCDs: Haematology, Oncology (Cancers), Nephrology, Neurology and cardiology diseases constituted about three quarte (74.47%) of the NCDs and they accounted for 20.62%, 20.18%, 15.16%, 9.48% and 9.03% of the NCDs respectively as shown in Table 2 and Fig. 1.

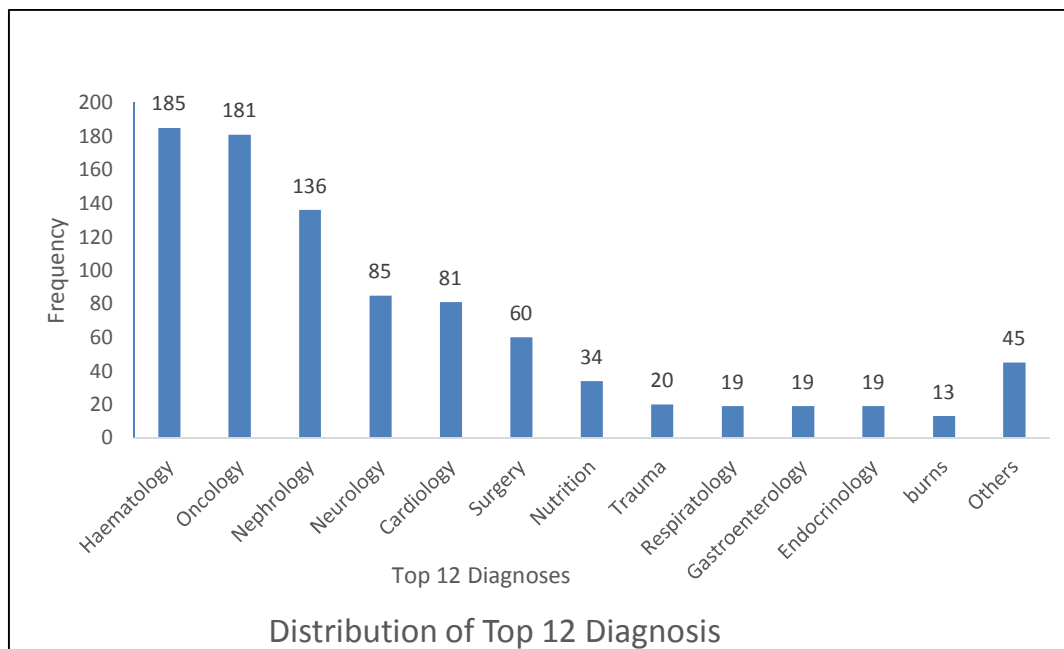
Table 1. Demographic distribution of the study population

Variable	Frequency (n = 897)	Percentage
Gender		
Male	570	63.55%
Female	327	36.45%
Age group		
≤ 1 year (Infants)	249	27.76%
2 – 5 years (Preschool)	258	28.76%
6 – 9years (School age)	139	15.50%
10 – 18 years Adolescents)	251	27.98%
Age distribution		
Minimum Age (months)	0.5	
Maximum Age (years)	18	
Mean Age \pm SD	6.01 ± 5.14 years	

Table 2. Pattern of NCDs

Class of diagnosis	Frequency	Percent
Haematology	185	20.62%
Oncology (Cancers)	181	20.18%
Nephrology	136	15.16%
Neurology	85	9.48%
Cardiology	81	9.03%
Surgery	60	6.69%
Nutrition	34	3.79%
Trauma	20	2.23%
Respiratology	19	2.12%
Gastroenterology	19	2.12%
Endocrinology	19	2.12%
Burns	13	1.45%
Dermatology	12	1.34%
Orthopaedics	10	1.11%
Others	23	2.57%
Total	897	100.0%

Others : Ophthalmology, ENT, Psychiatry, Rheumatology, Multiple congenital anomaly, Poisonings, Socials

**Fig. 1. Pattern of the top 12 NCDs**

Pattern of the NCDs by age groups: Among the NCDs, Haematology, Oncology, Nephrology and endocrine disorders were commoner in the older children while cardiac, nutritional, respiratory and neurologic disorders were more prevalent in younger children. The distribution of the NCDs among the age group was not statistically significant (Fischers exact 0.9800).

Relative frequencies of the common NCDs: Sickle cell anaemia was the prevalent

Haematological disease constituting 176 (95.1%) of all haematological cases. Acute lymphoblastic leukaemia, Nephrotic syndrome, Seizure disorder, Ventricular septal defect and Marasmic-Kwashiorkor were the prevalent cancers, Nephrology, cardiac and Nutritional disorders and constituted 50 (27.6%), 39 (28.7%), 33 (40.74%), 21 (25.0), 25 (51.52%) of the diseases respectively. Bronchial asthma and Diabetes Mellitus were the commonest Respiratology and endocrine disorders.

Table 3. Pattern of the NCDs by age groups

Diagnoses	≤ 1 year (Infants)	2 – 5 years (Pre-school)	6- 9 years (School age)	10 – 18 years (Adoloscents)	grand total	Fischer's exact
Haematology	18 (9.73)	52 (28.11)	49 (26.49)	66 (53.65)	185 (100.0)	1.67 (0.9800)*
Oncology	32 (17.68)	59 (32.60)	24 (13.26)	66 (36.46)	181(100.0)	
Nephrology (Renal)	22 (16.18)	40 (29.41)	26 (19.12)	48 (35.29)	136(100.0)	
Neurology	40 (47.06)	21 (24.71)	10 (11.76)	14 (16.47)	85(100.0)	
Cardiology	65 (80.25)	8 (9.88)	3 (3.70)	5 (6.17)	81(100.0)	
Surgery	13 (21.67)	24 (40.00)	11 (18.33)	12 (20.0)	60(100.0)	
Nutrition	24 (70.59)	10 (29.41)	0 (0.0)	0 (0.0)	34(100.0)	
Trauma	4 (20.00)	6 (30.00)	4 (20.00)	6 (30.0)	20(100.0)	
Respiratology	4 (21.05)	9 (47.37)	2 (10.53)	4 (21.05)	19(100.0)	
Gastroenterology	9 (47.37)	5 (26.32)	2 (10.53)	3 (15.79)	19(100.0)	
Endocrinology	6 (31.58)	4 (21.05)	0 (0.0)	9 (47.37)	19(100.0)	
Burns	3 (23.08)	4 (30.77)	2 (15.38)	4 (30.77)	13(100.0)	
Dermatology	4 (33.33)	3 (25.00)	2 (16.67)	3 (25.00)	12(100.0)	
orthopaedics	1 (10.00)	5 (50.00)	0 (0.0)	4 (40.00)	10(100.0)	
Others **	4 (17.39)	8 (34.78)	4 (17.39)	7 (30.44)	23 (100.0%)	

*Others **: Ophthalmology, ENT, Psychiatry, Rheumatology, Multiple congenital anomaly, Poisonings, Socials; *Not statistically significant*

Table 3a. Relative frequencies of the common NCDs

Haematology	Oncology	Nephrology	Cardiology	Surgery	Nutrition
Sickle Cell Anaemia 176(95.1)	Acute lymphoblastic leukemia 50 (27.6)	Nephrotic syndrome 39 (28.7)	Ventricular Septal Defect 33 (40.74)	inguinal hernia 24 (40.0)	Marasmic Kwashiorkor 17 (51.52)
Hemangioma 1 (0.5)	Rhabdomyosarcoma 18 (9.9)	Acute kidney injury 30 (22.1)	Downs Syndrome with cardiac disease 12 (14.81)	Appendicitis 9 (15.0)	Failure to Thrive (FTT) 87(21.21)
Rhesus incompatibility 1 (0.5)	Nephroblastoma 18 (9.9)	Obstructive Uropathy 17 (12.5)	Atrial Septal defect 6 (7.41)	infantile hydrocele 8 (13.3)	-Kwashiorkor 5 (15.15)
Bleeding disorder 1 (0.5)	Retinoblastoma 13 (7.2)	Chronic Kidney injury 15 (11.0)	Patent Ductus Arteriosus 6 (7.41)	subacute Appendicitis 1 (1.6)	Marasmic-Kwashiorkor 4 (12.12)
Obstructive adenopathy 1 (0.5)	Non-Hodgkin lymphoma 11 (6.1)	Bladder Outlet Obstruction 3 (2.2)	Tetralogy of Fallot 4 (4.94)	multiple finger contractures 1 (1.6)	-

Table 3b. Relative frequencies of the common NCDs

Trauma	Respiratology	Gastroenterology	Endocrinology	Neurology
RTA Injuries 11 (52.3)	Bronchial Asthma 17 (89.4)	Biliary Atresia 6 (31.5)	Diabetes Mellitus 12 (63.1)	Seizure disorder 21 (25.0)
multiple bruises due to assault 2 (9.5)	laryngomalacia with upper airway obstruction 1 (5.2)	Peptic ulcer disease 2 (10.5)	Hyperthyroidism 1 (5.2)	Hydrocephalus 8 (9.5)
Head trauma with Intracranial Hemorrhage 2 (9.5)	Aspiration Pneumonitis 1 (5.2)	Upper GI bleeding 2 (10.5)	Beckwith Wiedemann Syndrome 1 (5.2)	Cerebral palsy with seizure disorder 5 (5.9)
penetrating abdominal injury 1 (4.7)		Pyloric stenosis 1 (5.2)	Hypoglycaemia 1 (5.2)	Intracranial Tumor 2 (2.3)
facial laceration 1 (4.7)		Idiopathic hepatitis 1 (5.2)	Multiple congenital Anomalies 1 (5.2)	CVD with Left hemiplegia 2 (2.3)

Table 4. NCDs and outcome

Class of Diagnosis	Absconded	DAMA	Died	Referred	Transferred	Discharged	Grand Total	Fischer's exact
Haematology	1 (0.54%)	4 (2.16%)	1 (0.54%)	0 (0.00%)	0 (0.00%)	179 (96.76%)	185 (100.00%)	0.6544 ^f
Oncology(cancers)	3 (1.66%)	9 (4.97%)	21 (11.60%)	2 (1.10%)	5 (2.76%)	141 (77.90%)	181 (100.00%)	
Nephrology	1 (0.74%)	1 (0.74%)	4 (2.94%)	1 (0.74%)	0 (0.00%)	129 (94.85%)	136 (100.00%)	
Neurology	0 (0.00%)	7 (8.24%)	3 (3.53%)	3 (3.53%)	5 (5.88%)	67 (78.82%)	85 (100.00%)	
Cardiology	0 (0.00%)	2 (2.47%)	2 (2.47%)	3 (3.70%)	0.00%	74 (91.36%)	81 (100.00%)	
Surgery	1 (1.67%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	2 (3.33%)	57 (95.00%)	60 (100.00%)	
Nutrition	1 (2.94%)	1 (2.94%)	1 (2.94%)	0 (0.00%)	0 (0.00%)	31 (91.18%)	34 (100.00%)	
Trauma	0 (0.00%)	1 (5.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	19 (95.00%)	20 (100.00%)	
Respiratology	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	1 (5.26%)	18 (94.74%)	19 (100.00%)	
Gastroenterology	0 (0.00%)	1 (5.26%)	0 (0.00%)	0 (0.00%)	1 (5.26%)	17 (89.47%)	19 (100.00%)	
Endocrinology	0 (0.00%)	0 (0.00%)	1 (5.26%)	0 (0.00%)	0 (0.00%)	18 (94.74%)	19 (100.00%)	
burns	0 (0.00%)	0 (0.00%)	2 (15.38%)	0 (0.00%)	0 (0.00%)	11 (84.62%)	13 (100.00%)	
Dermatology	0 (0.00%)	1 (8.33%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	11 (91.67%)	12 (100.00%)	
orthopaedics	0 (0.00%)	0 (0.00%)	0 (0.00%)	1 (10.00%)	0 (0.00%)	9 (90.00%)	10 (100.00%)	
Others**	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	2 (8.70%)	21 (91.30%)	23 (100.00%)	
Total	7 (0.78%)	27 (3.01%)	35 (3.90%)	10 (1.12%)	16 (1.78%)	802 (89.41%)	897 (100.00%)	

Others : Ophthalmology, ENT, Psychiatry, Rheumatology, Multiple congenital anomaly, Poisonings, Socials

Table 5. Age and outcome of the NCDs

Age groups	Absconded	DAMA	Died	Referred	Transferred	Discharged	Total	Chi-square/P-value
≤ 1 year	1 (0.40)	7 (2.81)	7 (2.81)	6 (2.41)	6 (2.41)	222 (89.16)	249 (100.0)	21.99 (0.1081)**
2 - 5years	2 (0.78)	6 (2.33)	7 (2.71)	1 (0.39)	5 (1.94)	237 (91.86)	258 (100.0)	
6 – 9 years	2 (1.44)	7 (5.04)	4 (2.88)	0 (0.0)	4 (2.88)	122 (87.77)	139 (100.0)	
10 – 18 years	2 (0.80)	7 (2.79)	17 (6.77)	3 (1.20)	1 (0.40)	221 (88.05)	251 (100.0)	

*** Not statistically significant*

NCDs and Outcome: Of all the NCDs, there were 802 (89.41%) discharges, 35 (3.90%) deaths and 27 (3.01%) discharges against medical advice (DAMA). A total of 112 Deaths occurred in the Paediatric wards over the study period, 35 (31.25%) of these deaths were caused by NCDs. Patients with Cancers constituted 60% (21/35) of all deaths. Of the 27 patients whose parents/caregivers discharged against medical advice (DAMA), 9 (34.6%) were children with cancers, while 7 (25.92%) had neurological NCDs. Majority (96.76%) of the patients with the commonest NCD – Haematology, were discharged home in stable state while only 141 (77.90%) of the patients with cancers were discharged home. (Table 4) The duration of hospital stay ranged from 1 to 60 days with an average duration of 7.4±6.6.

Age and outcome of the NCDs: There was a near equal distribution of the outcome measures of the NCDs by age, however, more deaths occurred in the older children. There was no statistically significant association between the outcomes and the age groups ($p=0.1081$).

4. DISCUSSION

The observed prevalence rate of 21.52% of NCDs in this study is high and is similar to 19.8% and 26.9% reported from findings from earlier studies [10,11]. It is however below the predicted 80% disease burden by 2020 [3,4]. This prediction may be true of NCDs in adults but in children, communicable diseases still assume a prominent role in the aetiology of diseases in the subtropics.

The leading five NCDs observed in this study includes; Haematological, oncological (cancers), nephrology, neurology and cardiology disorders. This pattern of NCDs has remained stable over the last decade as a similar pattern was reported by Otaigbe, et al. [11] and Emodi. et al. [10] about a decade ago. Yawson, et al. [13] also reported Sick cell anaemia as the commonest NCD in Ghana. Sick cell anaemia constituted 95.1% of the haematological disorders in this study. This pattern of NCDs in children is at variance with that reported in adults where cardiovascular disease (CVD), cancers, chronic respiratory diseases (CRD), and diabetes are the predominant cause of morbidity and mortality among them.

Sickle cell anaemia, a red cell haemoglobin disorder in which an individual inherits two

abnormal haemoglobin gene one from each of the parents (carriers) in an Autosomal recessive inheritance pattern is a preventive disorder. For it to still top the list of NCDs in children means that not much is being done about its preventive measures or that whatever that is being done is not getting to the grassroots. Creating more awareness using every avenue to curb this preventive disorder is imperative. This NCD is not commonly reported in adults probably because many of them may have died in childhood or many have learnt to manage the common crisis associated with the disease or have developed long term complications associated with the disease which includes CVD and metabolic disorders.

Oncological (Cancers) diseases that were once thought to be alien especially in children is becoming quite prevalent in the subregion. The oil and gas exploration and environmental pollution of industrial waste and gases may be playing significant role in cancer aetiology among people in South-South Nigeria. The emerging nature of cancers in children is still being perceived as a mirth especially in this part of the world. For this wrong belief and poor financial resource, many caregivers will discharge against medical advice (DAMA) following this diagnosis and many who DAMA eventually die at home. Generally, cancers are associated with a poor prognosis and this is worse in the subregion where there are few Paediatric oncologists, limited diagnostic tools, unavailability and expensive chemotherapeutic agents and prevalent poverty. This is worsened by a wrong perception among many caregivers when this diagnosis is made in their children. Yawson, et al. [13] in Ghana reported that caregivers believed children suffer NCDs because of sins of parents/ancestors, that herbalists/spiritualists have insights into treating NCDs and that many have previously used herbs/traditional medicine for treatment of child's illness. Badasu, et al. [14] in another study in Ghana also reported a similar finding in addition to the fact that parents/caregivers believed that their children's NCDs could be caused by enemies and this belief cuts across social, educational and religious backgrounds. This wrong belief system further worsens its prognosis as many would present late to health care facilities after their meagre resources have been expended while seeking for help in the wrong places. Measures aimed at reducing the environmental gas pollution by engaging relevant stakeholders, education of our people that is focused on

changing their wrong belief system with attitudinal change about cancers and NCDs in general must be vigorously pursued to reduce cancer prevalence and the poor prognosis associated with the disease.

NCDs were more prevalent in males as was reported by previous studies [10]. An X-chromosome [15] linked transcription factor that guards against disease have been implicated. This factor is said to cause increased antibody and haematopoietic series production through modification of the globin gene and transcription factor programming [16]. Since females are doubly endowed with the X-chromosome they are generally conferred with a stronger protective effect against diseases.

In this study, Haematology, Oncology, Nephrology and endocrine disorders were commoner in the older children while cardiac, nutritional, respiratory and neurologic disorders were more prevalent in younger children. A similar finding of the distribution of the NCDs among the younger and older age groups was reported by Emodi, et al. [10] in South East Nigeria. The high prevalence of cardiac and nutritional disorders in younger children observed in this study is not surprising. This is because most nutritional disorders are prevalent in the young age as well as the observed cardiac disorders which are mainly congenital and so are commoner in early childhood. More of the common NCDs and its associated mortality in this study were more prevalent in older children who have managed to overcome the problem of infectious diseases in their younger age. This finding is important as it calls for age-specific preventive measures.

NCDs constituted about a third (31.25%) of all deaths in the Paediatric wards in this study despite a slightly lower morbidity rate, also, more deaths occurred in the older children unlike in infectious diseases. In many infectious diseases, under-fives are more susceptible and more likely to succumb to the illness due to the relative immaturity of their immune system. This is contrary in NCDs where older age may not be a strong determinant factor in terms of survival as was found in this study. This reported death rate is actually a tip of an iceberg as many children with NCDs do not present to hospitals due to erroneous beliefs and poverty and so die at home, similarly many of those who DAMA eventually also die at home [17]. One of the common causes of DAMA especially among parents of children with NCDs is poverty [18].

This is because medical care is expensive and many of these children spend a long time in hospitals as was found in this study, when this cost is borne solely by poor parents with no insurance or Medicaid, Government or non-governmental organisation support, DAMA becomes the path of least resistance. Therefore, instituting legislation for government support of NCDs would better its outcome. Cancers constituted 60% of deaths due to NCDs in this study and this calls for provision of cancer screening tools as some of these cancers are preventable and early detection improves their prognosis. Increased general health education of our people to increase cancer awareness and attitudinal change towards cancers and NCDs generally may cause a shift in the belief system and improve health seeking behavior of the people.

5. CONCLUSION

This study shows that there is a high burden and high mortality rate associated with NCDs in children in our environment. Haematology, Oncology (Cancers), Nephrology, Neurology and cardiology diseases were the common pattern of NCDs observed in this study. Since the pattern of NCDs found in this study has remained similar to that observed in previous studies in South-South and South-East Nigeria, preventive measures like health education of the people on attitudinal change towards NCDs, early cancer screening and availability of the screening tool, premarital genotype counselling and screening, availability of prenatal diagnosis of SCA centres and government legislation to provide financial support to families with NCDs is advocated to avert the challenge of double burden of NCDs and communicable diseases.

6. LIMITATION OF THE STUDY

Since this was a retrospective study with data retrieved from non-digital central and patients records, it is not uncommon that some records may be missing and others incompletely recorded. Comparing these NCDs with the social economic status and residential areas of the parents/caregivers may have established some associations, however these were not well documented in the central registers.

CONSENT

As per international standard or university standard written parents consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

Ethical approval for the study was obtained from the Ethics and Research committee of the NDUTH while permission was obtained from the Head of Paediatric Department of UPTH.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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