The Pattern of Morbidity and Mortality in Children and Adolescents Presenting at the Emergency Unit of The University of Abuja Teaching Hospital

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ABSTRACT

There is a lot of information on the causes of childhood morbidity and mortality in developing nations. This has driven the introduction of preventive health programs aimed at reducing under five mortality. This is not the same for under-5 survivors. With few studies in the morbidity mortality patterns seen among this age group, they lack similar age related disease intervention programs. Therefore this study aims to describe the pattern as seen in a paediatric emergency unit in a developing country. The study was carried out in the Emergency Paediatric Unit (EPU) of the University of Abuja Teaching Hospital (UATH). The admission records of patients 5-16 years for the period January 2008 to December 2012 were reviewed, demographic and clinical data were extracted and entered into Microsoft EXCEL. Data were analyzed, presented in frequency tables and prose. Case fatality rates were calculated where necessary. A total of 4591 children were admitted during the period, 1137 (23.7%) were aged 5-16 years. Malaria was the commonest infectious disease diagnosed while sickle cell anaemia was the commonest non-communicable disorder. The commonest vaccine preventable disease encountered was tetanus. Mortality was highest in children aged 5-7 (39.1%). The major causes of death were infectious diseases, with malaria and tetanus accounting for 42.7% of the total deaths. Infectious diseases remain the major cause of morbidity and mortality in children over 5 years of age in developing countries. Control of these diseases and improved care of non-communicable illnesses would expectedly reduce morbidity and mortality.

Keywords: Adolescent, Communicable Diseases, Malaria, Immunization

INTRODUCTION

Evidence seems to suggest a significant global progress in reduction of child deaths over the past three decades[1]. Not only has mortality declined but the disease prevention measures have contributed to improvement in child health[1,2]. Despite these global gains, developing nations still have persistently high childhood mortality rates. In the Global burden of Disease study for 2010[3], 76% of deaths in sub-Saharan Africa were attributable to communicable, maternal, neonatal and nutritional causes.

Most studies on child mortality in developing nations focus on the morbidity/mortality patterns of children under five years of age. However as children in these regions survive the under five period, they continue to grow in the same, and sometimes worsening, adverse conditions, militating against health. These include poor sanitary conditions, poverty, high illiteracy and failure of the primary health care systems amongst others.

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Furthermore as children move into their school age years and on to adolescent age, their health needs change, reflecting changes in their biological, psychological and social characteristics. By adolescence, health issues are closely related to pubertal changes and/or the testing and noncompliance characteristics of that age group[4,5]. Programs targeted at reducing under 5 mortality do not address these changing health needs of older children.

It is important to define the health challenges of these children as they transit from under 5 survivors into adulthood. Defining the morbidity and mortality burden would help enable better, and age specific, strategic planning for this fast growing population. It is hoped that this study will help drive targeted health care services for this age group by contributing to the needed body of knowledge. Also the study is expected to form a basis for subsequent studies among this subgroup. The aim of this study was to describe the emergency room morbidity mortality pattern of children aged 5-16 years. The specific objectives were to determine major diseases causing morbidity and mortality in this age group, and to describe the disease outcome of children in these age groups.

MATERIALS AND METHODS

This was a retrospective cross sectional descriptive study. Admission records of children 5-16 years admitted into the EPU between January 2008 and December 2012of the University of Abuja Teaching Hospital were reviewed. The EPU caters for medical and surgical emergencies (excluding burns, factures and road traffic accident victims) of children between the ages of 29 days to 16 years. It serves the Federal Capital Territory (FCT) and the neigh bouring states of Niger, Nasarrawa, Kogi, Kaduna. Demographic and clinical data were extracted which included age, gender, principal diagnosis and emergency room outcome. The principal diagnosis was based on the assessment by the managing unit at admission. It was based on the presenting clinical features, with or without the results of laboratory tests. Emergency room mortality was the only outcome extracted. Collected data were entered into spreadsheet using Microsoft EXCEL 2007. Analysis was mainly descriptive. Percentages, ratio, mortality/case fatality rates calculations were done. Frequency tables and prose were used to present results.

Ethical approval was obtained from the Research and Ethics Committee of the University of Abuja Teaching Hospital

RESULTS

During the study period, a total of 4591 children were admitted into the EPU of which 1137 (24.7%) were aged 5-16 years. There were 673 males and 464 females (M:F ratio of 1.4:1). The mean age was 9.1±3.04 years. There were 416(36.6%) children aged 5-7 years, while 350 (30.8%) were aged 8-10 years and 371(32.6%) were aged 11-16 years (Table 1).

Table 1: Age Distribution of Study Population

Age (years)	No. of cases	%
5-7	416	36.6
8-10	350	30.8
11-16	371	32.6
Total	**1137**	**100**

Table 2 shows the ten most frequently occurring diseases/disorders by age group. Malaria and sickle cell disease had the highest number of admissions followed by septicemia. Of The 257 cases with malaria, 200 were severe malaria with 44(22%) been cerebral malaria; while other forms of severe of malaria (severe anemia, hyperpyrexia, seizures, hypoglycaemia and severe prostration) occurred in 156(78%) of the cases. Of the 129 cases of septicaemia recorded, 91(70.5%) were assessed to have typhoid septicaemia. Recorded cases of malaria were highest in children 5-7 years old while the most number of patients with sickle cell anaemia was seen in the 11-16 years old children.

Table 2: Majorcauses of Morbidity by Age Group

Disease/Age group(yrs)	Total (%)	5-7 (%)	8-10 (%)	11-16 (%)
Malaria	257(22.6)	126(49.0)	78(30.3)	53(20.6)
SCA	164(14.4)	50(30.5)	53(32.3)	61(37.2)
Septicemia	129(11.3)	43(33.3)	45(34.9)	41(31.8)
Tetanus	48(4.2)	12(25.0)	14(29.1)	22(45.8)
ALRTI	47(4.1)	24(51.1)	13(27.7)	10(21.3)
Surgical conditions	45(3.9)	12(26.6)	16(35.5)	18(39.9)
HIV/AIDS	38(3.3)	12(31.5)	13(34.2)	13(34.2)
Meningitis	35(3,1)	14(40.0)	12(34.3)	9(25.7)
ADD	32(2.8)	14(43.7)	10(31.2)	8(25.0)
Asthma	21(1.8)	8(38.1)	5(23.8)	8(38.1)

SCA-Sickle Cell Anaemia, **ALRTI**- Acute Lower Respiratory Tract Infection, **ADD-** Acute Diarrhoeal Disease, **HIV/AIDS**- Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome

Table 3 shows the prevalence of non-communicable diseases occurring in the study population. A total of 23.3% of patients were diagnosed with a non-communicable disease. Of the nine various non-communicable diseases/disorders recorded during the study period, sickle cell anaemia was the leading cause of morbidity and this was noticed to increase with increasing age; with children aged 11-16 years having 37.2% of such cases. Asthma had the second highest prevalence.

The prevalence of psychiatric disorders, renal disorders and diabetes mellitus was highest in the adolescent population while heart disease and cancers were highest among children 5-7 years of age. Heart disease was seen in the 17 children (13 presented with congenital heart lesions while 4 had acquired heart lesions of which 3 had rheumatic heart disease and 1 had dilated cardiomyopathy). Renal disease contributed 4.5% of non-communicable diseases; 7 were diagnosed with chronic renal disease and 6 with nephrotic syndrome. The malignancies included brain tumor (3), leukemia (3), lymphoma (3), osteosarcoma (1) and retinoblastoma (3). Among the children with SCA, the commonest presentations were vaso-occlusive crises (107). There were 9 cases of acute psychotic disorder.

Table 3: Non-Communicable Diseases in the Study

Disease/Age group (yrs)	Total (%)	5-7	8-10	11-16
SCA	164(14.4)	50(30.5)	53(32.3)	61(37.2)
Asthma	21(1.8)	8(38.1)	5(23.8)	8(38.1)
Convulsive disorder	19(1.7)	7(36.8)	5(26.4)	7(36.8)
Heart disease	17(1.5)	8(47.1)	5(29.4)	4(23.5)
Malignancy	13(1.1)	5(38.5)	3(23.0)	5(38.5)
Renal disease	12(1.0)	5(41.7)	1(8.3)	6(50)
Psychiatric disorders	10(0.8)	0	1(10)	9(90)
Diabetes mellitus	9(0.7)	1(11.1)	1(11.1)	7(77.8)
Chronic liver disease	1(0.08)	0	0	1(100)

SCA-sickle cell anaemia

Table 4 shows the number of diseases on the National Programme on Immunization (NPI) vaccine requirement list which were observed in the study population. Tetanus had the highest prevalence and was highest in the adolescent age group. Measles was not observed in the adolescent age group.

Pyelonephritis, urinary tract infection, acute hepatitis, pharyngo-tonsillitis, drug reaction, acute lower gastrointestinal bleeding, food poisoning and cellulites, organophosphate poisoning and acute glomerular nephritis were other minor contributors to disease burden with 5 cases each.

Table 4: NPI Vaccine Preventable Diseases in Study Population

Disease/Age group(yrs)	Total (%)	5-7 (%)	8-10 (%)	11-16 (%)
Tetanus	48(4.2)	12(25)	14(29.2)	22(45.8)
Tuberculosis	11(0.9)	4(36.4)	3(27.2)	4(36.4)
Measles	8(0.7)	5(62.5)	3(37.5)	0

During the study period, a total of 549 children died in the EPU of which 110(20.03%) were children aged 5-16 years. The mortality pattern in the study population is shown in Table 5. A total of 110 children died giving a mortality rate (MR) of 9.67%. Five diseases were seen to have the highest mortality with tetanus ranking number one. Tetanus had a case fatality rate (CFR) of 52% and across the age groups the case fatality was highest in children 11-16years (44%). The second highest mortality rate was observed in patients with severe malaria (59.1% being due to cerebral malaria alone). It was observed that children aged 5-7 years had highest mortality from severe malaria, septicemia and HIV/AIDS.

Mortality also occurred in children with pneumonia (3), tuberculosis (3), diabetes mellitus, lower gastrointestinal bleeding, fulminate viral hepatitis (3), food poisoning, chronic liver disease, malignancy, severe acute malnutrition, severe drug reaction, encephalitis, chronic kidney disease, acquired/congenital heart diseases , acute renal failure, hemorrhagic stroke.

Table 5: Mortality/Case Fatality Rates by Diseases and Age Groups

Disease/Age group (yr)	Total (%)	CFR	5-7 (%)	8-10 (%)	11-16 (%)
Tetanus	25(22.7)	52.1	6(24)	8(32)	11(44)
Severe Malaria	22(20)	11	14(63.6)	5(22.7)	3(13.6)
SCA	17(15.4)	10.4	4(23.5)	7(41.2)	6(35.3)
Septicemia	12(10.9)	9.3	9(75)	1(8.3)	2(16.7)
Meningitis	7(6.4)	20	3(42.8)	2(28.6)	228.6
HIV/AIDS	5(4.6)	13.1	4(80)	0	1(20)
Others	22(20)		6	9	8
Total			**46**	**32**	**32**

CFR- case fatality rate. **SCA**-Sickle Cell Anaemia, **HIV/AIDS**- Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome

DISCUSSION

There is a paucity of research directed at the morbidity and mortality patterns in children over 5 years of age especially in the emergency settings in our environment. This may not be unrelated to the attention being paid to the under five population as they still maintain the highest burden of childhood mortality in developing countries. Several studies from paediatric units looking at childhood morbidity/mortality or both, captured this population of children alongside neonates and children under five years of age[6-11]. In doing this, a true reflection of the burden of diseases in this age group is lost in the infant and childhood mortality rates. Therefore, the awareness required to drive target health care service planning towards these groups of children, especially adolescents, is not created.

The number of children aged 5-16 years in this study was low. However the number of children per age grouping was similar. This was a similar observation in the above five years population in other hospital based studies done in various parts of Nigeria[6-11]. The implication of this as it affects health outcomes of children in this age range and an uptake of hospital services by older children, requires further research.

The disease pattern in this study is also similar to observations in other local studies,[6-12] infectious diseases being the leading causes of morbidity and mortality. The high morbidity and mortality from infectious diseases, many of which are preventable, are of great concern. The morbidity mortality from infectious diseases seen in studies[7,8,11] from different regions in the country are not unlike those of other developing countries[3,13].

It would thus appear that the gains brought about by the development of better antibiotics and vaccines are dwarfed by the contributors to the persistence of infections in developing countries such as poverty, poor vaccination strategies, and failure of primary health care services to name a few[15].

Falciparum malaria, an extensively researched disease condition in sub-Saharan Africa, is a major cause of morbidity and mortality in children as was also observed in this study. There was a decline in the contribution of

malaria to morbidity with increasing age; with children aged 11-16 years having the lowest number of diagnosed cases of malaria. This is not an unexpected finding as research has shown that in children who remain in endemic areas of malaria transmission, the prevalence of parasitemia and the risk of morbidity and mortality caused by malaria decrease markedly with age beyond early childhood[16-18].

Other infectious diseases observed in this study which contributed to morbidity were typhoid septicaemia, and tetanus. Both are vaccine preventable diseases; tetanus being part of the routine National Program of immunization (NPI) vaccine schedule. Typhoid is not an uncommon disease in the age of children in this study. In studies by Rabasa *et al.*[19] and Ogunleye *et al.*[20] the incidence of typhoid was highest in children 5-9years and 5-11years respectively. However a low incidence of suspicion and the unreliability of the commonly used Widal test contributes to the under diagnosing of typhoid fevers[19].

In developing countries where both typhoid and malaria are endemic, the correct diagnosis is important to ensure proper treatment, as the complications of each are grave. The Paediatric Association of Nigeria has recommended the inclusion of the oral typhoid vaccine from 2 years of age and revaccination every 4 years[21].

Of note is the morbidity due to tetanus in this study. This disease is a global health problem and has a high mortality both among children and adults in Nigeria.[22,23] Ina previous 2 year review of post neonatal tetanus from this study center 82.2% of tetanus cases occurred in children aged 5-14 years[24]. As with that study, none of the children in this study had received booster doses of the tetanus vaccine and only 24% completed their immunization schedule. Studies by Fatunde[26] and Orimadegun *et al.*[27] observed that a the failure to receive booster doses of tetanus toxoid, a lack of knowledge about booster doses and a lack of awareness of the disease and how to prevent it contribute to the persistence of tetanus in our environment.

The N.P.I. vaccine schedule for this disease covers children under 1 of age and pregnant women; there is no inclusion of the necessary childhood booster doses. Completing 3 doses of tetanus vaccine, as provided in the current N.P.I. schedule, has been shown not to provide optimal levels of protective antibodies for long lasting immunity[25-27]. The recommendations of the Paediatric Association of Nigeria[21] for inclusion of booster doses for older children in the N.P.I. schedule, if adopted by the necessary authorities, will help boost the immunity in children and thus, help to reduce the incidence of the disease. Till this is done medical workers should educate parents on the need for booster doses of the vaccine.

Measles, another N.P.I. vaccine preventable disease, was observed only in the younger age groups. It did not feature prominently in above 5 age group in other studies reviewed[6-12]. However, in the study by Ojukwu *et al.*[28] in children from 10-24 years, the prevalence of mumps and measles was 0.4%.

The contribution to morbidity of HIV/AIDS, lung infections, meningitis and acute diarrhoeal diseases in this study was similar to that observed by Duru *et al.*[6].

The morbidity from non-communicable diseases was less than a quarter of total diseases. The existence of non- communicable chronic health conditions in the face of the unsolved problem of infectious diseases in sub-Saharan Africa, described by WHO[29] as the double burden of disease, is of concern. Of the non-communicable disease causing morbidity, sickle cell anaemia (SCA) had the highest number of cases in the study population and ranked fourth of the top ten causes of morbidity. Nigeria has the largest burden of SCA in the world with approximately 150000 babies born yearly with the SCA[30].SCA is a public health issue which requires attention from health advocates[30]. The main cause of morbidity in the group of children was acute bone pain crises. This was also the commonest cause for admission in the study by Brown et al in Ibadan[31]and George et al in Enugu[32].

The pattern of non-communicable diseases observed in this study would seem to reflect the survival of children from genetic disorder (SCA, congenital heart lesions) while they are yet developing other forms of chronic health challenges (asthma, cancer, diabetes, psychiatric disorders).

The overall emergency room mortality in children 5 years and above, 20.03% was higher than obtained by Ibeziakor (12.3%) and Duru (15.03%) who also had similar study duration. The could be due to the inclusion of children aged 5years in this study, which was not the case in the aforementioned studies. There was however similarity in the main causes of mortality,

infectious diseases, from other centers[6-13,33]. Tetanus had the highest mortality and this had the highest case fatality overall and within each of the age groups. Mortality due to tetanus was the 4th highest cause of death in the study by George *et al* in Port Harcourt[33].

As with morbidity, mortality due to infectious diseases is a multifaceted problem. Re-infection is inevitable, especially where immunity has been compromised due to malnutrition[34,35]. The long term effects on the growing child of recurrent/chronic infections have adverse consequences on adult health status and the economic work force of the nation.

With the current state of health of children older than 5 years of age hanging in the balance it is necessary to improve health services targeted at our growing children to prevent/ameliorate the scars that maybe brought on by the combinations of infectious and non-infectious diseases. Addressing the health issues of our under-5 survivors will require concerted efforts by healthcare providers, donor agencies and governments of developing countries to tackle. More research into mortality and morbidity of older children would be required to better address these health challenges.

CONCLUSION

Infectious diseases are the main causes of morbidity and mortality in children older than 5 years seen in this study. The contribution of vaccine preventable tetanus is worrisome and should be a major target of disease prevention in this age group. Child survival programs targeted at children above five years of age, particularly the adolescent population, should be instituted. This would include not just addressing immunization booster doses but also the reawakening of the school health program and adolescent health services in paediatric departments nationwide. These will not only reduce mortality but ensure a healthier adolescent and adult population for the future.

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