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Review of Paediatric Mortality in a Tertiary Hospital in Nigeria

Dr Said Mohammed Amin[1], Dr Audu Lamidi[2], Dr Mairami Amsa[3]

[1]Department of Histopathology, National Hospital Abuja, Abuja, Nigeria

[2, 3]Department of Pediatrics, National Hospital Abuja, Abuja, Nigeria

Running Title: Amin et al. Pediatric mortality in a tertiary hospital

Abstract: ***Introduction: Pediatric mortality is a cause for serious concern particularly in resource-poor countries all over the world. Indeed it is estimated that in 2010, about 99% of the 7.7 million death of children globally occurred in low to medium income countries (LMIC) including Nigeria. This study provides data of pediatric mortality from a tertiary hospital in Abuja the capital of Nigeria. Setting: National Hospital Abuja is a 450-bedded tertiary public hospital located in the cosmopolitan city of Abuja the capital of Nigeria. Methods: This is a retrospective analytical study involving all admissions for patient of neonatal to 15-year age extending from 1st January 2008 to 31st December 2017. Result: Pediatric mortality accounts for 4.9% of 14,690 pediatric admissions with a 1.3:1 male-female ratio. Most mortality (44%) occurred within the first 4 days of hospital admission and the most vulnerable age group is the neonatal age group (67%). The commonest causes of death are prematurity, neonatal jaundice and congenital malformations in neonates. Conclusion: Pediatric mortality is high in National Hospital Abuja and involves predominantly neonates.***

Keywords: Pediatric mortality, causes of death, mortality rate, resource poor country

1. Introduction

Pediatric mortality is a cause for serious concern in resource-poor countries all over the world. Indeed it is estimated that in 2010, about 99% of the 7.7 million death of children globally occurred in low to medium income (LMIC) countries including Nigeria. [1] Furthermore it has been reported that under-five mortality in Nigeria is the eighth highest in the world which obviously is a huge setback to achieving the Sustainable Development Goal 3 by 2030. Effective strategies to contain the scourge require ample knowledge about the magnitude and other characteristics of the mortality burden. This is unfortunately defective as population based studies are lacking and data is at best, speculative. Hospital-based reports therefore provide surrogate data for evaluation of pediatric morbidity and mortality as well as policy formulation. Temporal trends in hospitalization and mortality due to various diseases serve as pointers at disease worsening, increased health care utilization and also allows for evaluation of mortality burden attributable to different diseases. [2, 3] This study provides data about pediatric deaths from a tertiary hospital in Abuja the capital of Nigeria.

Setting

National Hospital Abuja (NHA) is a 450-bedded tertiary public hospital located in the cosmopolitan city of Abuja the capital of Nigeria. The hospital initially conceived to cater primarily for women and children was named National Hospital for Women and Children (NHWC) and subsequently expanded to provide service to all category of patients under the name NHA in 2005. The hospital clientele is derived from the Federal capital and surrounding states of the federation as well as referrals from other distant located states.

2. Materials and Methods

This is a retrospective analytical study involving all admissions for patient of neonatal to 15-year age extending from 1st January 2008 to 31st December 2017. Data is obtained from the hospital database and supplemented with information from the mortuary records and bed head folders. Analysis of the data is carried out with Microsoft Excel 2011 software. Diagnosis and categorizations are based on the International Classification of Diseases ICD-10 format.

3. Results

The total in-patient pediatric admission for the period extending from 1st January 2003 to 31st December 2017 is twenty four thousand two hundred and ninety one (N=24,291) composed of (N=10,674) female and (N=13,617) males. One thousand, five hundred and seventy nine (N=1579) pediatric deaths were recorded within that period, composed predominantly of male (N=885, 56.0%) and fewer females (N=694, 44.0%) given a male to female ratio of 1.3:1. The overall crude pediatric mortality rate is 6.5%.

The ages of the deceased children ranged from 0 to 15 years with a mean of 1.4 years and a standard deviation of 3.02.Under-five mortality accounts for 92% (N=805) while neonatal death constitutes 67% of the total mortality. Over 80% of the deceased are below the age of 1 year and this age cohort constitutes the peak age for both sexes.This is depicted in Figure 1.

Annual distribution of mortality reveals a gradual rise to apeak in 2009 followed by a falling trend to the 2015 level as depicted in the chart 2 below. The lowest number of death in the study period was recorded in 2006.

Majority of the death (N=601, 69%) occurred within four days of admission with more than 44% (N=384) of mortality occurring on the first day of admission.

The most prominent cause of neonatal death is prematurity (N=158, 21.9%)followed by neonatal jaundice (N=48, 6.6%) and congenital malformation(N=37, 5.3%). Other causes, alsoof infective nature include malaria (N=38, 5.3%),sepsis (N=30, 4.1%),meningitis (N=25, 3.5%) and viral infections (N=23, 3.2%).This is illustrated in Figure 3 below. The most predominant cause of death in the under-5 year olds are infections (N=36, 5.0%), malaria (N=31, 4.3%) and pneumonia (N=25, 3.5%). Traumatic conditions account for 2.5% (N=22) composed of burns (N=11), road traffic accident (N=5), fall from height (N=2), poisoning (N=2) and drowning (N=2).

The total number of pediatric autopsies performed within the period is fifty-seven (N=57) given a Crude (Pediatric) autopsy rate of 3.6%.

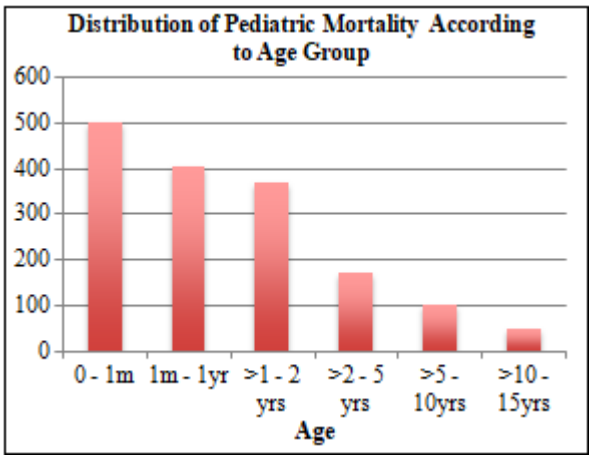

Figure 1: Showing the distribution of pediatric mortality by age group.

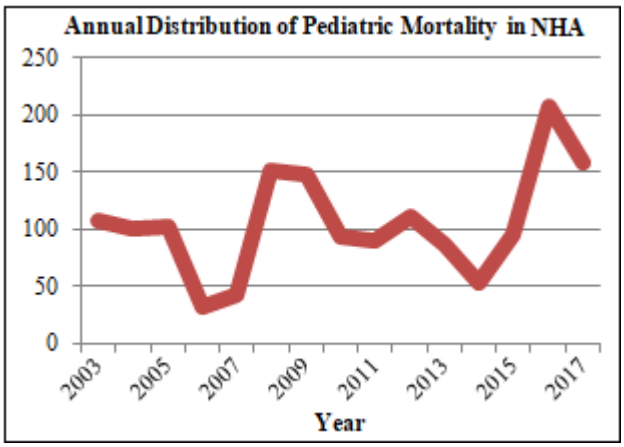

Figure 2: Showing the distribution of pediatric mortality over a 15-year period.

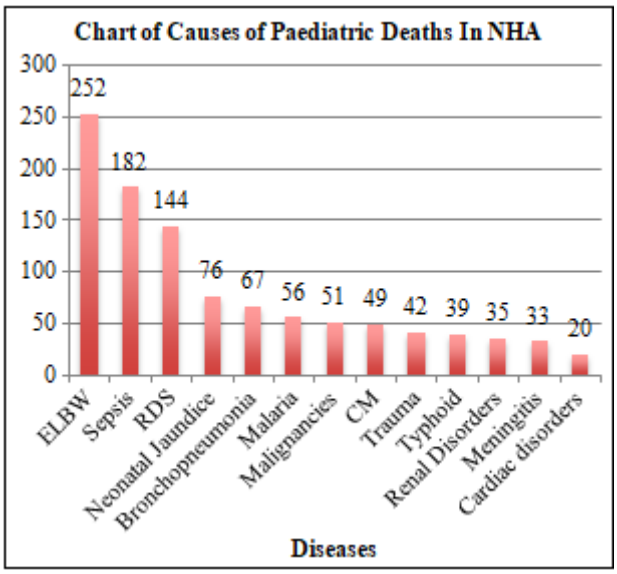

Figure 3: Chart showing distribution of causes of neonatal death in NHA. Key: ELBD= Extreme Low Birth Weight; RDS= Respiratory Distress Syndrome; CM= Congenital Malformations;

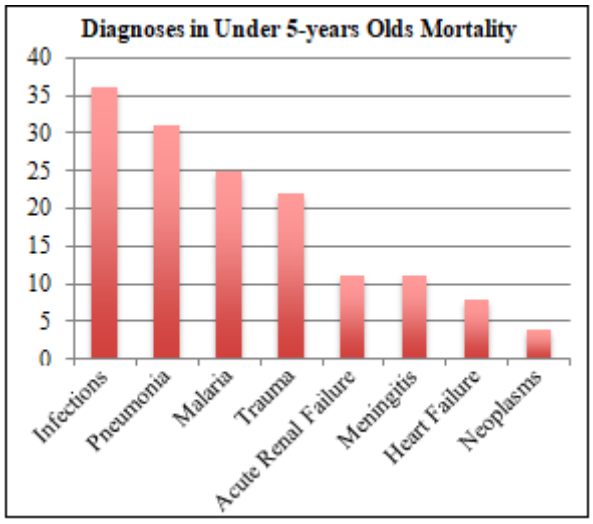

Figure 4: Chart showing distribution of causes of death among under 5-yrs old children in NHA in a decade.

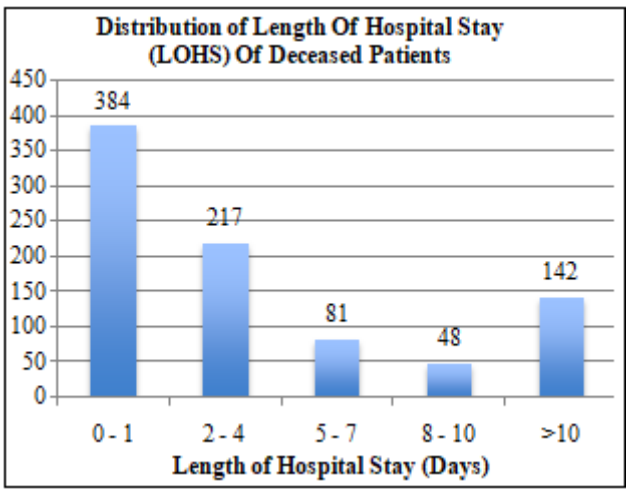

Figure 5: Chart showing the distribution of length of hospital stay of decedents in NHA

4. Discussion

A review of the literature revealed a glaring dearth of information on pediatric mortality from low and medium income countries (LMIC) like Nigeria. Indeed a meta-analysis by Livingston [4] et al looking at over 2000 studies of pediatric surgical outcomes from LMIC, within a 6-year period, reported that only 78 (3.7%) studies specifically addressed pediatric mortality. Moreover, most reports are from institutions rather than population-based research and majority are cause-specific in context. Several studies reporting cause-specific pediatric death rates emanating from African countries related to HIV, [5] malaria, [6] trauma, [7] sickle cell disease [8] and burns, [9] showed significantly higher frequencies in comparison to reports from developed countries. However, similar studies from Asia looking at pediatric cause-specific death rate among asthmatics, [10] trauma [11] and pulmonary hypertension, [12] showed a comparable trend to our findings.

In terms of gender distribution of mortality, most workers reported [13] a slight male preponderancethat is in consonance with the findings in our study (1.3:1).

The crude death rate obtained in this study (6.5%) compares with the report from post-war, pre-Ebola study from Liberiawith pediatric mortality of 5.4%, [14] lower than that of Ilesa (13%), [15] Zaria (15.1%)[16] andIrruah(17.5%) in Nigeria[2] as well asother centers in Africa [17] India (12.9%) [18] and Afghanistan (8%). [19] On the other hand our rates are higher than reports from Iran (1.35%) [20]

The reason for the higher childhood mortality in our center may not be unconnected with the fact that mostly complicated moribund cases are brought from peripheral conventional hospitals as well as quasi-medical unlicensed centers.

The commonest cause of death among the neonatal age group was prematurity (N=158, %) followed closely byneonatal jaundice (N=48, %)and congenital malformations (N=37, %). This contrasts with the study from Cameroun [21] where neonatal sepsis was predominant followed by prematurity and congenital malformations; Irruah[2] where birth asphyxia, sepsis and malaria (in that order) are predominant and report from Ghana where sepsis, birth asphyxia and pneumonia were leading. [22]

Among children of less than 5 years agethe commonest cause of death is infections (N=38)followed by pneumonia and malaria. The contributions of malaria, sepsis, malnutrition and pneumonia to pediatric mortality in our studies are significant (15%) and are borne out in reports fromCameroun.[14] Indeed a study reported 70% of death in some African hospitals[11] were due to these three conditions. Additionally a nation wide verbal autopsy study of pediatric death in Nigeria implicated malaria and pneumonia together with birth injury, asphyxia and diarrheal diseases as the culprit responsible. [23] Furthermore WHO also listedmalaria, sepsis and lower respiratory disease, together with diarrheal diseases, prematurity, birth asphyxia, birth trauma, measles and tetanus as the commonest causes of pediatric death in African countries. On the contrary reports from developed countries present an entirely different picture. Thus, a study in Netherlands looking at pattern of mortality among 16,874 low-risk admission children found a mortality of only 86 (0.5%) and these were attributable to chronic conditions and unplanned admissions mainly. [24]

The **length of hospital stay (LOHS)**is generally used to provide insight into the severity of disease, the quality of care as well as related factors. In our study majority of the deceased children (69%) died within the first four days of admission. Whether this is an indictment on the emergency care of children or other yet unclear factors needs to be investigated.

Length of hospital stay (LOHS) studies reveals, in emergency conditions, children have an earlier temporal distribution of deaths compared to adult. [25] The study indicated over 51% of children die within the critical emergency period following trauma as against 44% among adults.

The most vulnerable groups in our study are the neonates and infants accounting for the largest proportion of death from causes that are largely preventable. This is at variance with an observational cohort study that reported no mortality difference across age strata. [26] On the other hand studies from other LMIC presented by the Global Health Observatory data stated 46% of death among children in 2016 were neonates. [27]

The role of **autopsies** in enriching the mortality dialogue cannot be overemphasized. The pediatric autopsy rate in our study is an abysmal 3.6%, which is far below expectation when compared with reports from developed countries like Sweden, Hungary, Australia, UK with 34%, 68.9%, 12% and 15.3% respectively. [28, 29] Most LMIC centers have similar or even lower autopsy rates which are further declining with time. Indeed even in developed countries the rates are showing a downward trend [30] believed to be attributable to physicians unwillingness to request for autopsy and parents reluctance to give consent. [31] Efforts have to be intensified towards improving the autopsy rates if mortality is to be effectively tackled.

The highest number of deaths in our study occurred on Saturdays, which might give tacit credence to the suggestion that pediatric deaths on weekend are more likely and higher than during weekdays. [32] This might be a direct outcome of hospital institutional weekend work schedules and policies.

Various studies have reviewed certain risk factors in pediatric mortality and reported some thought-provoking findings. These include malnutrition as a risk factor in pediatric burns patients. [33] Other studies suggest multiple-medical-team-reviewed patients are at higher risk of mortality than single-team-reviewed children. [34] The latter implying patients whose condition necessitates multiple team reviews should be considered high-risk groups and appropriate measures taken in their management.

A WHO paper opined child deaths can be prevented by providing certain fundamentals like immediate and

exclusive breastfeeding as well as improving access to skilled health professionals during antenatal, birth and postnatal periods. Malnutrition may be tackled by improving access to nutrition and micronutrients. Basic needs of human survival like water, sanitation, hygiene and immunizations must also be addressed.

5. Conclusion and Recommendation

Paediatric mortality is still high in our centerwith an albeit slight decline over the years. More males are dying thanfemales. Appropriate and special care of those at high risks like the malnourished.

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