

The Frequency And Distribution Of Neural Tube Defects (NTDs) at Arthur Davison Children Hospital (ADCH)

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ABSTRACT

Background: Neural Tube Defects (NTDs) are the world's second most common birth defects after cardiovascular defects. In developing countries like Zambia, these defects are unrecognized and under reported. Despite the administration of folic acid, there have been incidences of NTDs though no local literature points out the frequency of these defects. In order to make informed interventions and programmatic decisions that will achieve significant reductions in patients with NTDs, local studies are needed. There is a need to describe the burden of NTDs and identify gaps in available NTD data. Therefore, the aim of this study is to determine the frequency and distribution of Neural Tube Defects (NTDs) at Arthur Davison Children Hospital (ADCH).

Methods: A cross sectional retrospective study was conducted to review medical records of children aged 1 day to 5 years who attended ADCH between 2018 and 2020 w. All children that were attended to during the study period were included in the study provided they meet the inclusion criteria. Data was collected using a data extraction sheet and descriptive analysis was done using Statistical Package for Social Science (SPSS) version 16.

Results: A total of 52 patients with NTDs were identified from October 2018 to May 2020 patients' registers, which constituted the study sample. The sample had more boys 61.5% than girls 38.5% female with the majority 78.8% aged between one day to twenty-eight days. The majority of the children were from Copperbelt province with 88.5%, while the minority were from Muchinga province 1.9%. However the majority of children were from Ndola district 61.5% and the minority from Mpika district 1.9%. The study showed that many children (96.2%) presented with Spinal Bifida (SB) and lastly encephalocele (3.8%). Myelomeningocele was the most common type of SB (21.2%). Hydrocephalus was the most common associated anomaly (19.2%) while the least associated anomaly was Microcephaly (3.8%).

Conclusion: The study showed that the majority of children were from Ndola district on the Copperbelt province and most children were admitted between day one and twenty eight days after birth. SB was the most common type of NTDs, and among these, those with myelomeningocele were the majority. Hydrocephalus was the most common associated impairment with majority of patients not undergoing any surgical interventions. The findings from this record review suggest that management of children with NTDs in Zambia is faced with challenges such as late presentation. This is consistent with literature which indicates that developing countries have higher incidences of children with NTDs and yet are faced with many challenges related to prevention and management.

Keywords: Neural tube defects; Spinal bifida; Meningocele; Myelomeningocele; Encephalocele; Zambia

BACKGROUND

Neural Tube Defects (NTDs) are a group of congenital defects of the central nervous system, resulting from failure of the

neural tube to close during the first few weeks of foetal development (Padmanabhan 2006).

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NTDs are classified according to the anatomical structures affected: the cranial structures, anencephaly (major part of the brain is absent) or encephalocele (protrusion out of the skull of sac-like meninges and brain tissue), or the spinal structures (spina bifida), meningocele (sac protrudes out of the spine) or myelomeningocele (sac contains spinal cord and nerves). The defect is classified as closed if skin covers the defect and it is classified as open if skin does not cover the defect. Children with NTDs, especially spina bifida, may survive with lifelong neuromuscular, orthopaedic and sometimes cognitive and language disabilities. Global estimates of birth defects indicate that 7.9 million children are born with birth defects each year and of these 90% are born in low- and middle-income countries (Christianson, Howson & Modell 2006). Neural tube defects (NTDs) are the second most common group of serious birth defects, following cardiac abnormalities, which result in infant mortality and severe disability. The worldwide incidence of NTDs is estimated to range between 1.0 and 10.0 per 1000 births (Au, Ashley-Koch & Northrup 2010). A systematic literature review on NTDs (1990–2014) by found that the reported incidence of NTDs varied greatly between and within regions. The regional incidence per 10 000 births was 11.7 in Africa, 21.9 in the Eastern Mediterranean, 9 in Europe, 11.5 in the Americas, 15.8 in South-East Asia and 6.9 in the Western Pacific. In hospital-based retrospective studies, an incidence of 7.5 per 1000 births was reported in Algeria (2004–2006) 3.5/1000 births in Sudan (2003–2004) and 2.2/1000 births in Nigeria (2011–2013) (Nnadi & Singh 2016). A retrospective study at a paediatric neurosurgical centre in Kenya (2005–2010) reported the incidence of spina bifida and encephalocele as 3.3/10 000 live births. In Zambia, a retrospective review of congenital anomalies at Arthur Davison Children Hospital (ADH) in Ndola district found CNS congenital anomalies to be the most common (40%). Hospital based prevalence and incidence rates which are common practice of reporting prevalence and incidence rates in most low and middle income countries may not reflect the actual prevalence. Neural tube defects are reported to cause approximately 88,000 deaths globally (in 2012) and 8.6 million disability adjusted life years [1-10].

METHODE

The study was carried out at Arthur Davison Children Hospital, which is the largest Children's referral hospital in Zambia, located in Ndola, the provincial capital for the Copperbelt province of Zambia. It's a tertiary hospital that caters mostly for referrals from the northern region of Zambia which include: Copperbelt, Northwestern, Luapula, Muchinga, Northern, and part of Central provinces of Zambia.

Target Population

All file records of patients aged between (0-5) years admitted to ADCH between 2016-2019.

Sagittal reconstruction was performed in the plane passing through the right edge of the inferior vena cava and the middle of the gallbladder, which approaches the plane separating the right

Study Design

This is a cross sectional retrospective study, to show the frequency and pattern of distribution of Neural Tube Defects presenting at Arthur Davison Children Hospital.

Sample Size

The sample size included all patients aged 0-5 years admitted to ADCH for NTDs between 2018 and 2020.

Sampling Procedure

The study population was identified using the ward and theater admission registers. Before data extraction from individual patient's medical records, a list of file numbers and names for all patients who were admitted between 2018 and 2020 was generated from the admission registers. Using the list, a search for individual patient files was conducted.

Inclusion Criteria

This study included male and female patients aged 0-5 years admitted to ADCH between 2018 and 2020.

RESULTS

The results of this study are presented under demographic characteristics, type of neural tube defect, associated impairment, surgical management and year of diagnosis.

Sample Demographics

(Table 1) shows the distribution of patients according to province of referral. The majority of patients were from Copperbelt province (88.5%). The distribution according to district comprised of 12 districts the highest being Ndola 32 (61.5%). The gender distribution for the study sample was 32 (61.5%) male and 20 (38.5%) female. The age distribution ranged from day 1 to 5 years with the majority (78.8%) aged between one day to twenty-eight days (n=41). Distribution according to year of diagnosis was from 2018 to 2020 with majority of cases in 2019 (48.1%).

Table 1: Distribution according to province

Province	Frequency(n)	Percentage(%)
Copperbelt	46	88.5
Luapula	3	5.8
Muchinga	1	1.9
Northwestern	2	3.8
Total	52	100

DISCUSSION

The aim of this study was to determine the profile of children with NTDs at a tertiary hospital in Zambia. The study included demographic characteristics, prevalence of NTDs, types of NTDs, site of the NTD, neurological status of the affected children and surgical management.

Demographic Characteristics

Lusaka had the highest number of patients. This could be because the study was conducted in Lusaka province which is in the southern part of Zambia of which Copperbelt province is outside Lusaka, where the study was conducted. In the current study, the high prevalence of children with NTDs was Ndola on the Copperbelt province which could be attributed to geographical accessibility as reported in another study which was done in Cameroon where the majority of the patients (66%) came from within the city of Yaounde where the hospital was based. Geographical accessibility is one of the dimensions of access that has been reported to favour people living in urban areas compared to those living in rural areas [11-15].

While findings on age at presentation are similar to some studies done in some African countries, there are other studies within Africa whose findings were contrary to this study. Studies reporting similar findings include a one year retrospective review conducted at UTH which reported an age range of one day to one month at presentation) and another one year prospective study conducted in a Nigerian neurosurgical unit, which reported the age at presentation to range from two days to 60 months with a mean age of between 5.8 to 11.47 months (Adeleye AO, 2010). On the contrary, a retrospective medical record review that was done in Cameroon (2000-2006) reported that about 44.13% of children presented on the first day of life with only 7.25% presenting between the first week and fourth week of life (Mweshi MM et al, 2010). The age on admission for children with NTDs is an important factor in determining the outcome of the management. Surgical closure for open NTDs should be done within 36 to 72 hours after birth to minimize the risk of CNS infection and improve the neurological outcome.

The male predominance in the current study is consistent with findings from another study done in Zambia (Simpamba M et al, 2018) and other similar studies in some African countries such as Nigeria (Burton B, 2008) and Cameroon (Farmer P and Kim J, 2008). Contrary to these findings, other studies done in Africa and other regions have reported female predominance among children with NTDs like a prospective study carried out in northwestern Nigeria on the prevalence of NTDs at Usmanu Danfodiyo University Teaching Hospital, Department of Obstetrics and Gynaecology (Singh S, 2018). There are many theories that are used to explain the gender variations among children with NTDs. One assertion is that female children are more likely to have cranial NTDs than spinal defects.

CONCLUSION

The study showed that the majority of children were from Ndola district on the Copperbelt province and most children were admitted between day one and twenty eight days after birth. SB was the most common type of NTDs, and among these, those with myelomeningocele were the majority.

Hydrocephalus was the most common associated impairment with majority of patients not undergoing any surgical interventions. The findings from this record review suggest that management of children with NTDs in Zambia is faced with challenges such as late presentation. This is consistent with literature which indicates that developing countries have higher incidences of children with NTDs and yet are faced with many challenges related to prevention and management [15- 20].

RECOMMENDATION

The late presentation and majority of patients not receiving surgical intervention indicates the challenges with accessibility of specialty services for children with NTDs in Zambia. In order to improve the health care delivery for these children, there is need for the government to provide transport to these children during first referral as well as follow up management. There is also need of sensitizing the community on the possibility of correcting NTDs in Zambia for children born with such defects and to seek medical attention as soon as possible in case of home delivery which are common in the rural areas. Furthermore, the outcome of patients who are lost to follow up is also not known and therefore there is need for research in this area so as to determine the outcome of these patients.

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