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Research Article

Birth asphyxia: a major cause of microcephaly in the Calabar, Nigeria

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ABSTRACT

Background: Birth asphyxia is a leading cause of neonatal mortality and survivors are at risk for neurodevelopmental sequelae including motor and cognitive disabilities. Microcephaly is a known consequence of severe birth asphyxia and may be accompanied by abnormalities such as cerebral palsy, seizures, developmental delay and intellectual disability. The work was designed to demonstrate the critical role played by birth asphyxia the causation of microcephaly in our environment.
Methods: All children seen in the Neurology Clinic of the University of Calabar Teaching Hospital (UCTH), Nigeria, from January 2014 to December 2014 with a diagnosis of microcephaly (OFC more than 2SD below the normal for the age) were recruited into the study. A detailed antenatal, birth, and developmental history were obtained. Clinical and neurological examinations were carried out. Hearing and vision of patients were assessed.
Results: Forty nine (10.5%) of the 465 children seen at the neurologic clinic had microcephaly. Birth asphyxia accounted for 35 (71.4%) of these children. Majority of the children with birth asphyxia were home delivery. Some (34.3%) were born in government approved centers including tertiary care facility. Epilepsy (71.4%) was the most common comorbidity associated with microcephaly.
Conclusions: The finding of this study demonstrates the persistent role of birth asphyxia in the aetiology of neurological damage in Nigerian children. The study agrees with previous surveys that severe birth asphyxia is a major cause of microcephaly in our environment in contrast to Western studies where genetic syndromes are predominant causes. Increased effort at preventing birth asphyxia including legislation is advocated.

Keywords: Microcephaly, Birth asphyxia, Comorbidities, Prevention

INTRODUCTION

Birth asphyxia is a leading cause of neonatal mortality accounting for 23% of all deaths during the new born period and one million deaths worldwide.[1,2] Survivors of birth asphyxia are at risk for neurodevelopmental sequelae including motor and cognitive disabilities.[3-5] Birth asphyxia remains an important cause of mental retardation, cerebral palsy and other neurodevelopmental disorders.[6,7] Studies in developed countries have found that 15 to 18% of infants who suffer moderate to severe asphyxia are disabled by eight years of age.[4] Although accurate estimates of neurodevelopmental sequelae from birth asphyxia in developing countries are not available, one of the best population studies of asphyxia in a developing country had documented that 18% of survivors of birth asphyxia had suffered a severe and permanent neurological impairment.[7]

Microcephaly, a known consequence of severe birth asphyxia is usually defined as a head circumference (HC) more than 2 SDs below the mean for age and gender.[8,9]

Microcephaly is observed 0.1% of general asymptomatic population and in 15-20% in children with developmental

delay in studies from Europe.[10,11] The prevalence of microcephaly found among children seen in neurodevelopmental clinics ranges from 6% to 40.4%, with an average prevalence of 25%.[12]

Microcephaly can be primary or secondary. Primary microcephaly is usually evident at birth and associated with a brain insult which occurred early in foetal life whereas secondary microcephaly occurs as a result of an insult to the brain later in foetal life or in the perinatal period.[13] Neurologic abnormalities such as cerebral palsy, seizures, developmental delay, and intellectual disability may accompany microcephaly. The frequency of these clinical manifestations varies depending on the underlying aetiology.[12]

This study was undertaken to demonstrate the role of birth asphyxia in the causation of microcephaly in our environment hence to draw attention to the need to focus more on the prevention severe birth asphyxia in our healthcare system.

METHODS

All children seen in the Paediatrics Neurology Clinic of the University of Calabar Teaching Hospital (UCTH) South-South Nigeria from January 2014 to December 2014 with a diagnosis of microcephaly (OFC more than 2SD below the normal for the age) were recruited into the study. Permission was obtained from the parents or and guardians of the children who participated in the study. The Paediatrics Neurology Clinic of the UCTH operates an outpatient clinic and sees children with diverse forms of neurological handicaps from Cross River State and its environs. A detailed history (antenatal, birth, and developmental) were obtained. History of any major illness during early infancy with a view to establishing the possible aetiology of the microcephaly was also taken.

Clinical and neurological examinations were carried out as per standard protocol. The head circumference was measured by placing a non-stretchable tape around the cranial vault to include the widest part of the forehead and the most prominent part of the occipital area to arrive at the largest possible measurement.[13] Microcephaly was defined as head circumference more than 2 SD below the mean for age and gender.[9,14] Associated manifestations such as deafness, blindness, seizure disorder and speech abnormalities were noted.

Patients were routinely referred to the Otorhinolaryngology and Ophthalmology services for assessment of their hearing and vision. Mental retardation was on clinical grounds of cognitive skills delays, language delay, and delays in adaptive skills such as significant delays in activities such as self-feeding, toileting, dressing, prolonged, messy finger feeding and drooling.[15]

Relevant investigations including TORCHES and HIV screening were done where necessary. Computerized tomography scan of the head was undertaken on the children whose parents could pay for the procedure.

RESULTS

During the period under review, 465 children with various neurological problems were seen in the Neurology clinic. Of this number, 49 or 10.5% had microcephaly. Thirty one (63.3%) of the microcephalic children were males while 18 (36.7%) were females giving a male: female ratio of 1.7:1.

The mean age at which children presented with microcephaly was 2.2 years ranging from 6 months to 14 years. The highest frequency 17 (34.7%) was found in children below one year of age while the least age group represented was children above 10 years.

Birth asphyxia accounted for 35 (71.4%) of the microcephaly in the series. Other underlying conditions were, chromosomal anomaly, TORCHES syndrome, CNS infections, craniosynostosis and congenital malformation of the brain (Table 1).

Table 1: Identified and presumed underlying causes of microcephaly in 49 clinic patients.

Aetiology	Frequency	Percentage
Birth asphyxia	35	71.4
Chromosomal abnormalities	4	8.2
TORCHES	3	6.1
CNS infections	3	6.1
Craniosynostosis	2	4.1
Brain malformations	2	4.1
Total	49	100

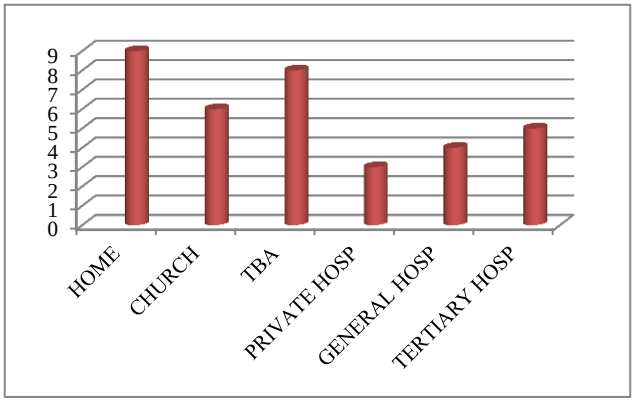

Figure 1: Places of delivery of the 35 children with birth asphyxia.

TBA = Traditional birth attendant

Nine (25.7%) of the 35 children with birth asphyxia were born at home while eight (22.9%) were born at the

facilities of Traditional Birth Attendants (TBA) followed by six in the church. Some were born in government approved centers including five (14.3%) in a tertiary care facility as shown in Figure 1.

The most common manifestation associated with microcephaly was epilepsy; the others were visual, hearing, speech impairment and psychomotor retardation (Figure 2).

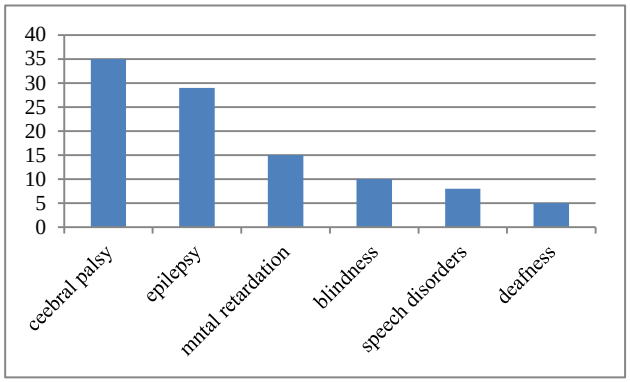

Figure 2: Associated clinical manifestations in microcephalic children.

Of the 35 patients with asphyxia-related microcephaly, 26 (74.3%) could afford a CT scan. The CT image of the 26 demonstrated various degrees of cerebral atrophy and parenchymal changes with ventricular dilatation.

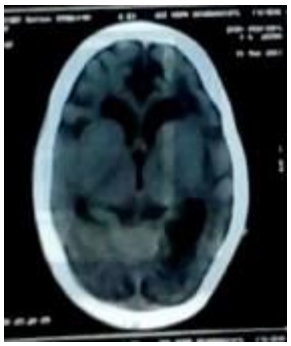

Figure 3: CT scan of a child with microcephaly from birth asphyxia showing ventricular dilatation, parenchymal damage and cerebral atrophy.

All 35 of the children with microcephaly due to severe birth asphyxia had cerebral palsy with 33 (67.5% of the 49) presenting with the spastic quadriplegic type while 2 (4%) had spastic iplegic type of cerebral palsy.

DISCUSSION

Severe birth asphyxia is a leading cause of neonatal mortality and permanent impairment in motor and cognitive functions among long term survivors.[2-4] Severe birth asphyxia still remains a problem in developing countries with an incidence of 100.2 per 1000 live births reported in some tertiary hospitals in Nigeria.[16,17] The findings of this study also demonstrate the persistent role of birth asphyxia in the aetiology of neurological damage in Nigerian children.

It is estimated that 15 to 18% of infants who suffer moderate to severe asphyxia get disabled by eight years of age.[7] Cerebral atrophy and other brain parenchymal lesions demonstrated in CT of our children confirm the devastating impact of asphyxia. It is therefore not surprising that a large number of these children presented with mental retardation, seizure disorder, visual and hearing impairment.

The present study agrees with previous surveys decades ago which showed that severe birth asphyxia was a major cause of microcephaly in our environment accounting for over 70% of cases in contrast to what is obtainable in Western studies where genetic syndromes such as trisomy 21,13,18. Cri-du-chat, Williams's syndrome and Cornelia de Lange syndrome are the leading causes of microcephaly.[13]

That epilepsy is a major complication of microcephaly is worrisome as some of these children could perish at home as a result of status epilepticus or other complications. Most of the children seen with microcephaly were less than two years of age. This may indicate that the older ones, who might have earlier consulted, later defaulted since the parents did not notice any improvement in this untreatable condition; subsequently, these children could have either been neglected, abandoned or have died from its complications. It may also be postulated that such children with funny small heads and possible frequent convulsions can constitute a social stigma in the family.[16]

The issue of visual, hearing, speech impairment and mental retardation throws up the challenge of institutional care of handicapped children in Nigeria. It is of import for government to establish such centres of care so as to take the load off the distressed parents. Indeed, each of the identified multiple impairments in these children need qualified personnel and specialist for the management of such conditions. Unfortunately, only very few centres in Nigeria can boast of either a speech pathologist or a child psychologist. Each State government in Nigeria should set up and run homes for handicapped children.

A high prevalence of birth asphyxia is reflection of a poor obstetric service provided in any community. Considering its implication as a major cause of microcephaly and its comorbidities, it calls for the strengthening of obstetric service in Nigeria. Birth asphyxia is highly preventable hence it is disturbing that some of the cases encountered in this survey occurred even in tertiary health institutions. It is known that most Nigerian women do not access antenatal care. Delivery outside the hospital setting is increasing in developing countries accounting for 60-80% of all births in Nigeria.[19] The UCTH studies have shown that even some of the

women who attend antenatal care in UCTH defaulted when in labour[20] in order to avoid high hospital fees or Caesarean section if they have been booked for trial of labour. It is known that these deliveries are conducted at home and in churches.[20] Unfortunately, it could be assumed that due to lack of facilities for resuscitation, including drugs and continuous supply of electricity and running water in most Nigerian health facilities, delivery in government approved medical institution, including teaching hospitals, may not guarantee safety.

CONCLUSION

Close supervision and monitoring of primary health facilities involved in taking deliveries, including traditional birth attendants, is strongly advocated. Legislation to ensure that deliveries are conducted only in approved facilities and birth asphyxia should be enlisted among the reportable conditions in Nigeria.

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