

NEONATAL SEIZURES IN CALABAR: A REVISIT

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(Received 9 August, 2007; Revision Accepted 7 July, 2008)

ABSTRACT

Newborns admitted with convulsion in the University of Calabar Teaching Hospital, Calabar during the period *1st May 2004 to 30 April 2006* were studied prospectively. The aim was to determine the place of birth in relation to the cause of seizures, the current situation in terms of the aetiology, clinical spectrum and outcome. There were 55 neonates with convulsion representing 5% of admissions into the newborn unit during the period. Birth asphyxia, sepsis, and hypoglycaemia were important identifiable aetiological factors which operated either singly (45.5%) or in concert (54.5% of cases) in causing seizures. Hypocalcaemia and hyponatraemia contributed less. These results are similar to that of a previous study carried out in this centre ten years earlier. There was no statistical significant difference between home and hospital deliveries in relation to causes of seizures. Septicaemia was caused mainly by *staphylococcus aureus*, *enterobacteriae* and *unclassified coliforms*. No neonatal meningitis was diagnosed. Surprisingly, there was a high prevalence of generalized seizures (76.4%). The mortality of 34.0% was related to onset of the seizures within 4 days of life but not the place of birth.

The causes of neonatal seizures in our environment are mostly preventable. There is need to provide modern facilities for investigating newborn seizures, training and retraining of Traditional Birth Attendants, health education of expectant mothers.

KEYWORDS: neonates, seizures, causes, place of birth, outcome.

INTRODUCTION

Neonatal seizures are the most frequent and earliest manifestation of neonatal neurological problems. Post-asphyxial hypoxic-Ischemic encephalopathy, metabolic disturbances and infections have been identified as important aetiological factors (Sheth, 2007, Asindi et al, 1995, Eriksson & Zetterstrom, 1979, Airede, 1991). Other causes include intracranial haemorrhage,

congenital anomalies and less frequently drug withdrawal, genetic disorders of amino and organic acids metabolism (Sheth, 2007, Asindi et al, 1995, Erikson et al, 1979, Airede, 1991).

The outcome of neonatal seizures is mainly dependent on the extent of cerebral insult, level of maturity of the baby and the underlying aetiology of the seizure (Kuban & Filiano, 1993). The early onset and

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asphyxia-related seizures appear to have the worst prognosis (Kuban & Filiano, 1993). These are associated with increased mortality, severe psychomotor retardation, cerebral palsy and epilepsy (Eriksson & Zetterstrom, 1979, Kuban & Filiano, 1993).

In Nigeria, incidence rates of 3.5-7.5 per 1000 live births have been reported (Airede, 1991, Omene et al, 1981). In another study done 10 years ago in Calabar, neonatal seizures accounted for 4% of admissions to the newborn unit with birth asphyxia, infections and hypoglycaemia as important causes (Asindi et al, 1995). These aetiological factors are often associated with deliveries outside of the hospital especially in homes of traditional birth attendants, churches, and private homes. There has been an increase in home delivery following the commercialization of hospital services and the downturn in the economic conditions of Nigerians (Owa et al, 1995).

This prospective study was therefore conducted to determine the relationship between the place of birth and the cause of seizures, the current situation in terms of the aetiology, the clinical spectrum, and the outcome of neonatal seizures.

Patients/Methods

Newborn babies admitted to the neonatal unit (SCBU) of the University of Calabar teaching hospital (U.C.T.H) with history of convulsion were prospectively studied from 1st May 2004 to 30th April, 2006. All consecutive patients that met the inclusion criteria were recruited. Identification of a seizure was clinically determined if abnormal movement occurred, either localized or generalized, were repetitive, stereotyped and associated with abnormal eye deviation. The babies were reviewed daily by a Consultant Paediatrician. Babies with only jitteriness with no convulsion and tetanus were excluded from the study.

A bio-data was kept and detailed history of pregnancy, place of birth, labour and delivery was taken with emphasis on possible birth

asphyxia. Each patient was investigated to determine the cause of seizure. Investigations carried out included random blood sugar, calcium, cerebrospinal fluid (CSF) analysis, blood culture, electrolytes, urea and creatinine. Electroencephalogram, neuro-imaging techniques, and viral cultures were not done due to lack of facilities.

Each baby was treated accordingly, and on discharge, was followed up in the neurology clinic. The causes of seizures were categorized based on clinical observation and laboratory results. The outcome of seizure was also documented. Since some patients have multiplicity of factors causing seizures, we attempted to identify and classify some causative factors as primary to others; the primary causes more likely occurring first before the secondary. In addition, all babies born in health centres, general hospitals or in teaching hospitals were classified as hospital delivery while those born outside (private homes, churches, Traditional Birth Attendants) were regarded as home-born.

The data were analyzed by EPI info 2002 version 6. Chi-square (χ^2) with Yates correction was calculated. P-value was significant at ≤ 0.05 .

Definitions

Severe birth Asphyxia following hospital delivery was based on APGAR scores of ≤ 3 in 5 minutes with clinical seizures. For home delivery, it was determined by history of failure to cry and gasping for prolong period after birth combined with inability to suck during the first few days of life. Blood glucose of 2.2mmol/L or less was regarded as hypoglycaemia for both term and preterm babies. Septicaemia/Meningitis was diagnosed with bacteriologically positive blood/CSF cultures.

RESULTS

General characteristics

A total of 55 babies with neonatal seizures were seen within the period. Eight patients left against medical advice after clinical

assessment and investigations were done. They were still used for some analysis except for mortality. Of the 55 babies seen, 33 were males and 22 females giving a male to female ratio of 1.5:1. There were, 1,109 neonatal admissions into the unit within the period thus making the prevalence of seizures in the centre to be 5%. Forty-seven (85.5%) of the babies were term while seven (12.7%) were preterm and only one (1.8%) was post term. Weight on admission ranged from 1.8 -3.7kg. Twenty-one (38.2%) of the babies were born at home while 34 (61.8%) were delivered in hospital.

Aetiology of seizures

Twenty-five infants (45.5%) had only a single cause of seizures while 30 (54.5%) infants had multifactorial causes (2 in 24 and 3 in 6 infants).

Table 1 shows the age of onset of seizures in relation to primary diagnosis. Birth asphyxia was the most common cause of seizures in the series with 39(70.9%) infants

involved. Of these 39, 9 were complicated with sepsis 4 with hypoglycaemia and 2 each by hypocalcaemia and hyponatraemia. The cause of asphyxia was mainly prolonged, obstructed labour, and intrapartum sepsis. Of the 55 cases seen, infections constituted 13 cases with confirmed septicaemia in 11 cases. Three of the infants with septicaemia had associated hypoglycaemia. The organism isolated from infected babies was mainly *staphylococcus aureus* 6, and *enterobactericeae* 3 and *unclassified coliforms* 2. The CSF yielded no bacterial growth. There were 3 cases of isolated hypoglycaemia; one of the 3 was an infant of a diabetic mother, while the other 2 had difficulty with breast feeding in the first 48 hours of life. There were 5 children with hypocalcaemia (with a range of 1.4-1.9mmol/L) associated with asphyxia (2 cases) and sepsis (3 cases). Two babies each with sepsis and severe birth asphyxia also had hyponatraemia (sodium less than 120mmol/L).

Table I: Age of onset in relation to diagnosis in 55 infants with seizures

Age of onset (days)	Asphyxia N (%)	Sepsis N (%)	Hypoglycaemia N (%)	Total N (%)
< 1	14	2	0	16
1-3	25	3	2	30
4-6	0	2	0	2
7 and above	0	6	1	7
Total	39(70.9)	13(23.6)	3(5.5)	55(100)

Table II shows the relationship between place of birth and causes of seizures. Of the 21 infants that were home born, 17 (81%) had birth asphyxia as the cause of seizure. Comparatively, 22 (64.7%) of those born in

hospital had birth asphyxia as the cause of seizure. There was however, no statistical significant difference between place of birth and causes of seizures ($P > 0.05$, RR (95%CI=1.14 (0.7-1.84)).

Table II: Relationship between place of birth and causes of seizure

Place of birth	Asphyxia N (%)	Sepsis N (%)	Hypoglycaemia N (%)	Total N (%)
Home	17(80.9)	3(14.3)	1(4.8)	21(100.0)
Hospital	22(64.7)	10(29.0)	2(5.9)	34(100.0)
Total	39(70.9)	13(23.6)	3(5.5)	55(100.0)

* 8 infants left against medical advice

Types of seizures

Seizures were observed to be mixed (focal and generalized) in 42 (76.4%) infants; and consistently focal in 13 (23.6%). Of the 42 cases with mixed seizures, 36 were of multiple and 6 of single aetiologies while the 13 cases with purely focal seizures were made up of 8 with multiple, and 5 with single aetiological factors.

Table III shows the outcome of infants with

neonatal seizures in relation to place of birth. The overall mortality rate was 34.0%. Parents refused autopsy based on religious and cultural reasons. Of the 47 babies that remained on admission to the end, 7 (43.7%) of the 16 babies that were home born died while 9(29.0%) of the 31 babies with seizures that were hospital born died. The differences was, however, not statistically significant ($P>0.05$). The mortality rate was higher in those that were born at home.

Table III: Place of birth in relation to outcome (n=47*)

Place of birth	Discharges N (%)	Death N (%)	Total N (%)
Home	9(56.3)	7(43.7)	16(100)
Hospital	22(71.0)	9(29.0)	31(100)
Total	31(66.0)	16(34.0)	47(100)

* 8 infants left against medical advice

In addition, table IV shows mortality figures in relation to age of onset of seizures. There were 8 (50.0%) and 7 (29.2%) death, among infants with age of onset of seizures less

than a day and between 1-3 days of life respectively. Therefore, the mortality was highest if age of onset of seizures was less than 4 days.

Table IV: Mortality figures related to age of onset of seizures (n=47*)

Age of onset (days)	No. of patients	No. of death N (%)	Mortality (%)
< 1	16	8	50.0
1 -3	24	7	29.2
7 and above	5	0	0.0
Total	47*	16	34.0

* 8 infants left against medical advice

DISCUSSION

The overall prevalence of neonatal seizures in this study was 5% of total admission for the period. This is similar to the prevalence observed in a previous study in this centre and compares with the 3 percent observed by Mento et al (1982). In this study; every seizure was determined entirely by clinical judgement without the aid of an encephalogram, thus, there were possibility of missing out infants with very subtle seizures. It is known that 42% of neonatal seizures occur without obvious clinical manifestation (Holden et al, 1982).

The present study showed that birth asphyxia, neonatal sepsis and hypoglycaemia in decreasing order were the commonest causes of neonatal seizures. Thus, the aetiology of neonatal seizures in this centre has not changed when compared to previous study (Asindi et al, 1995) and is similar to other reports (Sheth, 2007, Eriksson & Zetterstrom, 1979, Airede, 1991)

Birth asphyxia continues to be the commonest aetiological association of seizures in most centres (Sheth, 2007, Asindi et al, 1995, Eriksson & Zetterstrom, 1979, Airede, 1991). Of the 55 infants in the series, it accounted for 70.9% of cases. This is similar to the previously reported prevalence in this centre (Asindi et al, 1995) and by other workers (Eriksson & Zetterstrom, 1979, Airede, 1991, Kinoti, 1993, Calciolari, 1988). However, while improvement in obstetrics and neonatal care has resulted in a decline in birth asphyxia in developed countries, deliveries in the developing countries are still conducted largely at home, and churches by traditional birth attendants (Etuk and Etuk, 2001). Lack of proper referral system continues to contribute to increase risk of asphyxia (Kinoti, 1993). In the maternity centres and hospitals the dearth of manpower, coupled with lack of basic facilities for delivery and neonatal resuscitation (Asindi et al, 1995)

continue to contribute to the increasing frequency of severe birth asphyxia.

The existence of mixed aetiologies for neonatal seizures is well known (Asindi, 1995, Omene et al, 1981) as 54.5% of the children had mixed aetiologies operating in concert in our series. Many factors account for these problems. Most deliveries in Nigeria take place outside of the hospital; hence, prolonged obstructed labour with infection is a consequence (Asindi, 1995, Owa et al, 1995). The data available does not seem to show any differences in places of delivery. This is understandable because these patients usually are interfered with and spent long time with Traditional Birth Attendants (TBAS) before presenting in the hospital largely in moribund states. Most of the asphyxiated babies delivered in hospital were because of prolonged obstructed labour who reported late in hospital. The dearth of facilities to maintain asepsis during resuscitation may also be assumed to contribute to high infection rate in our series. However, the lack of statistical significant difference between hospital deliveries and home deliveries may be misleading. This is because majority of home-born infants affected might have perished at home without being reported. Age of onset of seizures in relation to aetiology is not different from previous studies (Asindi et al, 1995, Eriksson & Zetterstrom, 1979, Airede, 1991). Seizures following asphyxia occurred characteristically within the first 3 days of life; and agree with previous studies (Asindi, 1995, Calciolari et al, 1988). Seizures following metabolic abnormalities like neonatal hypocalcaemia and electrolytes imbalance do not appear to be common in our environment as seen in the previous study in this centre and in another previous study (Omene et al, 1981). More studies need to be done to confirm this claim. In this survey, neonatal hypoglycaemia caused seizure in 5.5% in contrast to the high incidence of hypoglycaemia (19%) reported by Airede, (1991) and the 12% of hypoglycaemia reported by Eriksson et al,

(1979). The majority of infants in our series were exclusively breastfed as distinct from the others. The overall mortality rate in our study was 34% which is lower than the previously observed 50% reported in this centre (Asindi, 1995). However, it is similar to the 34.5% seen in Benin (Omene et al, 1981) but higher than the 13% recorded by Eriksson and Zetterstrom, (1979) in Stockholm. The mortality was higher (50.0%) in infants whose seizures occurred within the first 24 hours of life which coincides with seizures caused by asphyxia. This confirms the fact that outcome of seizures following asphyxia and infection carried the worse prognosis as reported in the previous study in this centre and by several other workers (Asindi et al, 1995, Eriksson & Zetterstrom, 1979, Airede, 1991). The dearth of facilities for managing neonates in developing countries makes it difficult to improve the chances of the potentially salvageable neonates. The outcome of seizures in children that were home-born was not different from those of hospital-born. This is not surprising as the events that lead to seizures in both groups were the same (prolonged obstructed and infected labour). The role of intracranial haemorrhage in causing death among these infants could not be determined because of absence of neuro-imaging facilities and refusal of autopsies. Lack of facilities for thorough biochemical screening, and viral studies had made it impossible to determine the role of disease conditions that have not featured in our series such as some inborn errors of metabolism and the TORCHS syndrome.

CONCLUSION

The study has again highlighted the common aetiology and general pattern of neonatal seizures in our environment. The study has shown that home delivery has continued to be on the increase in this part of the world even though there is no statistically significant difference between home and hospital deliveries in relation to causes of seizure.

The aetiology of neonatal seizures, which are mostly perinatal, remains birth asphyxia and neonatal infections. The events leading to asphyxia are prolonged obstructed and infected labour. This result is not much different from a similar study carried out in this same centre. There is therefore need for a more concerted effort to improve medical facilities in our hospitals, re-training of TBAS since they continue to be patronized by pregnant women and encouraging urgent referrals of high-risk pregnancies. More diagnostic and therapeutic facilities should be provided to enhance accurate identification and prevention and possible treatment of seizure disorders in these babies. Health education needs to be directed at expectant mothers to use available health facilities.

REFERENCES

- Airede, K. I., 1991. Neonatal seizures and a 2-year neurological outcome. *J. Trop. Paediatr.* 37:313-317.
- Asindi, A. A., Antia-obong, O. E., Ibia, E. O. and Udo, J. J., 1995. Neonatal seizures in Nigerian infants. *Afr. J. Med. sci.* 24: 243-248.
- Calciolari, G., Periman, J. M. and Volpe J. J., 1988. Seizures in the neonatal intensive care unit of the 1980s: Types, Aetiologies, Timing. *Clin. Paediatr. (phila)*, 27:119-123.
- Eriksson, M. and Zetterstrom, R., 1979. Neonatal convulsion: Incidence and cause in the Stockholm area. *Acta. Paediatr. scand.*, 68:807-811.
- Etuk, S. J and Etuk, I. S., 2001. Relative risk of birth asphyxia in babies of booked women who deliver in unorthodox health facilities in Calabar, Nigeria. *Acta. Tropica.*, 79: 143-147.
- Holden, K.R., Mellits, E.D., and Freeman, J. M., 1982. Neonatal convulsions: correlation

- of prenatal and perinatal events with outcome. *Paediatrics*, 70:165-176.
- Kinoti, S. N., 1993. Asphyxia of the newborn in east, central and southern Africa. *East. Afr. Med. J.*, 70: 422-433.
- Kuban, K. and Filiano, J., 1993. Neonatal seizures. In: Cloherty, J. P., Stark, A. R., eds. *Manual of neonatal care*. Boston: Little Brown, 367-381.
- Mento, L. R., Fredman, R. M., and Ehrenkrenz, R. A., 1982. Neonates with seizures attributed to perinatal complications. *Am. J. Dis. Child.* 136: 548 - 50.
- Omene, J. A., Longe, A. C., and Okolo, A. A., 1981. Seizures in the Nigeria neonate: perinatal factors. *Int. J. gynaecol. Obstet.* 19:295-299.
- Owa, J. A., Osinaike, A. I., Makinde, O. O., 1995. Trends in utilization of obseteric Care at Wesley Guild hospital, Ilesa, Nigeria. Effects of a depressed economy. *Trop. Geogr. Med.* 47:86-88.
- Sheth, R. D., 2007. Neontal seizures. [eMedicine.com/neuro/topic240.htm.](http://eMedicine.com/neuro/topic240.htm), 3/1/2007.