

## Original Research Article

# Aetiology and comorbidities of cerebral palsy in a developing country

Komomo I. Eyong\*, Asindi A. Asindi, Chimaeze Torty

Department of Paediatric, University of Calabar Teaching Hospital, Calabar, Nigeria

**Received:** 17 June 2018

**Accepted:** 26 July 2018

**\*Correspondence:**

Dr. Komomo I. Eyong,

E-mail: [komomoeyong@yahoo.com](mailto:komomoeyong@yahoo.com)

**Copyright:** © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

### ABSTRACT

**Background:** Cerebral palsy (CP) is a common disabling condition of movement and posture causing activity limitation arising from a static injury to the developing brain. Common risk factors for cerebral palsy in Africa include severe birth asphyxia, kernicterus and neonatal infections. This study is aimed at determining the aetiology and comorbidities associated with cerebral palsy in our environment.

**Methods:** All children with CP presenting to the Paediatric Neurology clinic of the University of Calabar Teaching Hospital whose parent gave consent were recruited into the study. The biodata of the children and that of the parent's/ care givers were obtained. A detailed pregnancy and delivery history, neonatal history, seizures during first three years of life and developmental mile stones was documented.

**Results:** Seventy children with CP were recruited into the study of which 46 (65.7%) were males and 24 (34.3%) females. Majority of the children were from low social class and products of home, church or TBA'S delivery where supervision is poor. Severe birth asphyxia and CNS infections are the commonest identified risk factors. Spastic quadriplegic CP is the dominant type of CP followed by spastic hemiplegia. There is a significant statistical relationship between the aetiology and the type of CP. Epilepsy (60%) speech defect (42.9%) and microcephaly (40%) are the predominant comorbidities seen in the study. Cortical atrophy and ventricular dilatation are predominant CT findings in contrast to periventricular leukomalecia seen in developed countries.

**Conclusions:** Majority of the patients with CP in this study are from low social class and were delivered in places with poor obstetrics care. Improved perinatal care through an adequate social support system may reduce the burden of the disease.

**Keywords:** Aetiology, Comorbidities, Cerebral palsy

### INTRODUCTION

Cerebral palsy (CP) describes a group of permanent disorders of movement and posture causing activity limitation, which are attributed to non-progressive injury to the developing fetal or infant brain. It is an umbrella term encompassing a range of different etiologies and phenotypes.<sup>1</sup>

Although the *sine qua non* for CP syndromes is impaired motor function, 25-80% have additional non-motor impairments including: disturbances of sensation,

perception, cognition, communication and behaviour as well as epilepsy and other medical disorders.<sup>2</sup>

Birth asphyxia, kernicterus and neonatal infections are the commonest risk factors for cerebral palsy in Africa in contrast with most studies in the United States and Europe in which prematurity or low birth weight are major risk factors identified in almost all studies.<sup>3,4</sup>

The international clinical classification schemes for cerebral palsy is based on the dominant type of movement disorder and/or distribution pattern of trunk or limb involvement, whether spastic, ataxic or dyskinetic.<sup>5</sup>

Prevalence of cerebral palsy estimates from high income countries range from 2.2-3.3/1,000 while those in Africa are less precise with limited information depicting wide range of figures from 2-10/1,000 live births.<sup>6-9</sup>

The aim of this study is to determine the current aetiological factors and comorbidities associated with cerebral palsy in our environment especially with inclusion of neuroimaging in our management protocol.

**METHODS**

The study was carried out at the Neurology clinic of the University of Calabar teaching hospital, Calabar between December 2015 to November 2017.

All children presenting to the neurology clinic with diagnosis of cerebral palsy whose parent gave consent were recruited into the study.

The biodata of the children and that of the parent’s/care givers, including the educational qualification, occupation of the parents was documented. The social class of the parents was determined using the parent occupation and the educational qualification.

A detailed birth history including place of delivery, history suggestive of birth asphyxia, history of jaundice, gestational age at time of delivery. History of hospital admissions during the neonatal period and reasons for admission. History of seizures, developmental mile stones and past medical history during the first three years after birth were obtained.

A detailed neurological examination including visual and auditory assessment by the ophthalmologist and Otorhinolaryngologist, respectively, was carried out to determine the presence and type of visual or hearing defect.

Mental retardation was diagnosed 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.

Computerized tomography scan of the brain was undertaken on the children on all children diagnosed of having cerebral palsy.

Data obtained was entered into the SPSS software version 23 and checked for accuracy. It was analyzed using same software.

**RESULTS**

Seventy children were seen with cerebral palsy in the paediatric neurology clinic during the study period of which 46(65.7%) were males and 24 representing 34.3% of the subjects were females. The peak age incidence was among children between ages 1-5 years which accounted for 55.7% while the least were children aged between 11-15 years (Table 1).

**Table 1: Age sex relationship of the 70 children with cerebral palsy.**

Age	Sex		Total
	Male	Female	
< 1 year	3	10	13
1 - 5 years	29	10	39
6- 10 years	14	2	16
11 -15 years	-	2	2
	46	24	70

Fourteen of the children with cerebral palsy were from the high social class, 24 were from the middle social class and 32 from low social class. Majority of the children from the low social class parent were delivered either at home, church or TBA’S place while majority of those from high social class were delivered in a tertiary hospital. There is a significant relationship between the social and place of delivery (P<0.05) (Table 2).

**Table 2: Relationship between social class and place of birth.**

Social class	Place of birth						Total
	Teach Hosp	Gen Hosp	PHC	Home	Church	TBA	
High	10	1	0	1	2	0	14
Middle	5	3	8	2	4	2	24
Low	6	3	4	8	6	5	32
Total	21	7	12	11	12	7	70

Table 3 shows that birth asphyxia is the commonest cause of cerebral palsy in 55.7% of the study population followed by meningitis and viral encephalitis in 20% and

12.9% respectively. Prematurity is the least as it accounted for only 2.9%.

Epilepsy was the commonest comorbidity 42 (60%) of patients followed by speech defect and microcephaly in 42.9% and 40% of cases respectively (Table 4).

**Table 3: Aetiology of cerebral palsy.**

	Frequency	Percentage
Severe birth asphyxia	39	55.7
Meningitis	14	20
Viral encephalitis	9	12.9
Prematurity	2	2.9
Neonatal jaundice	6	8.6
Total	70	100

**Table 4: Comorbidities of children with cerebral palsy.**

Variable	Frequency	Percentage
Epilepsy	42	60
Speech defect	30	42.9
Microcephaly	28	40
Hearing impairment	24	34.3
Mental retardation	21	30
Blindness	18	25.7

**Table 5: Relationship between aetiology and type of CP.**

Social class	Place of birth					Total
	Teach Hosp	Gen Hosp	PHC	Home	Church	
Spastic quadriplegia	39	4	7	0	0	50
Spastic hemiplegia	0	10	2	0	0	12
Athtoid CP	0	0	0	0	6	6
Spastic diplegia	0	0	0	2	0	2
Total	39	14	9	2	6	70

Spastic quadriplegic CP is the commonest type of cerebral palsy followed by spastic hemiplegic while the least is spastic diplegia. Table v shows that there is a statistical significant relationship between the aetiology and type of cerebral palsy in the study ( $P < 0.05$ ). The CT findings include cortical atrophy with ventricular dilation (71.3%), cerebral hemi atrophy (17.1%), basal ganglion hypodensities (5.7%) and periventricular leukomalacia (2.9%) (Table 5).

**DISCUSSION**

Cerebral palsy remains a major cause of neurodisability in Nigeria. This study shows that 15.2% of new neurology cases presenting for consult in our facility are due to cerebral palsy. This is comparable to the finding of Nottidge et al in Ibadan, South Western Nigeria.<sup>10</sup>

The study shows that severe birth asphyxia, central nervous system infection, kernicterus and prematurity in descending order are the causes of cerebral palsy in Calabar, Nigeria. Severe birth asphyxia was seen in our study to constitute 55.7% of cases. which is high compared to previously obtained values in this environment and other parts of some developing countries.<sup>11-13</sup>

The high rate of patients with CP due to birth asphyxia in this study is due to poor obstetrics care occasioned by increasing number of deliveries conducted at home, churches and TBAs where they are unsupervised or attended by untrained midwives.

Central nervous system infection (meningitis and viral encephalitis) accounted for about a third of the case of CP in this study, a frequency comparable to that previously reported in this environment<sup>4</sup> and other parts of Nigeria and the developing countries in contrast CNS infection contributes a negligible percentage to CP in developed countries.<sup>11-13</sup>

Congenital malformations of the brain and vascular abnormalities such as cerebral artery occlusion are important causes of cerebral palsy in developed countries, these however, are uncommon aetiologies in developing countries.<sup>10-12,14,15</sup> This probably may be related to the unavailability of facilities in some centers of the developing countries where these studies were carried out.

Prematurity is the least among identified causes of cerebral palsy in our series in contrast to findings in Netherlands were low birth weight is a predominant cause of cerebral palsy.<sup>16</sup> The reason being that as a result of lack of facilities such as incubator care, poor or lack of power supply to support incubator care and infection in our environment most of our extreme low birth weight babies die within the first few weeks of life. Hence, they do not live enough to develop cerebral palsy.

The dominance of the spastic quadriplegic type of CP in this study is consistent with previously published data in other parts of developing countries.<sup>17-19</sup> In contrast to developed countries where spastic diplegia is the dominant type of CP seen.<sup>20,21</sup>

Epilepsy, microcephaly and speech impairment are the dominant comorbidity reported in this study which is comparable to previously documented findings in Africa.<sup>8,22,23</sup> The comorbidities documented in this study are commoner in patients with spastic quadriplegic type of cerebral palsy compared to the athetoid and diplegic types. This is likely due to the global cerebral involvement and malformations that occur in spastic quadriplegic CP. Lesser prevalence of seizures and other comorbidities were found in athetoid CP and spastic diplegia, probably because of the cortical sparing of the pathological events resulting in in this forms of CP.<sup>24</sup>

In concordance to the predominant type of CP seen in our environment, cortical atrophy with ventricular dilatation are the commonest CT findings in our study in contrast to periventricular leukomalecia seen in most studies in developed countries.<sup>25,26</sup>

## CONCLUSION

Majority of the patients with CP in this study are from low social class and were delivered in places with poor obstetrics care. Improved perinatal care through an adequate social support system may reduce the burden of the disease.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee of the university of Calabar teaching hospital*

## REFERENCES

- Bax M, Goldstein M, Rosenbaum P, Leviton A, Paneth N, Dan B, et al. Proposed definition and classification of cerebral palsy, April 2005. *Developmental medicine and child neurology.* 2005 Aug;47(8):571-6.
- Rosenbaum P, Paneth N, Leviton A, Goldstein M, Bax M, Damiano D, et al. A report: the definition and classification of cerebral palsy April 2006. *Dev Med Child Neurol.* 2007;109(Suppl):8-14.
- Gladstone M. A review of the incidence and prevalence, types and aetiology of childhood cerebral palsy in resource-poor settings. *Ann Trop Paedia.* 2010;30:181-96.
- Eyong KI, Asindi AA. Cerebral palsy in Calabar, Nigeria-a preliminary study. *Nig Med Prac.* 2010;58:105-10.
- SCPE. Surveillance of cerebral palsy in Europe: a collaboration of cerebral palsy surveys and registers. *Dev Med Child Neurol.* 2000;42:816-24.
- Pakula AT, Van Naarden Braun K, Yeargin-Allsopp M. Cerebral palsy: classification and epidemiology. *Phys Med Rehabil Clin N Am.* 2009;20:425-52.
- Himmelman K, Hagberg G, Uvebrant P. The changing panorama of cerebral palsy in Sweden. X. Prevalence and origin in the birth-year period 1999-2002. *Acta Paediatr.* 2010;99:1337-43.
- El Tallawy HN, Farghaly WM, Rageh TA, Shehata GA, Metwaly NA, Abo Elfto N, et al. Epidemiology of major neurological disorders project in Al Kharga District, New Valley. *Egypt Neuroepidemiol.* 2010;35:291-7.
- Couper J. Prevalence of childhood disability in rural KwaZulu-Natal. *S Afr Med J.* 2002;92:549-52.
- Nottidge VA1, Okogbo ME. Cerebral palsy in Ibadan, Nigeria. *Dev Med Child Neurol.* 1991;33(3):241-5.
- Ayanniyi O, Abdulsalam KS. Profile of Children with Cerebral Palsy Attending Outpatient Physiotherapy Clinics in Southwest Nigeria. *Afr J Physio Reha Sci.* 2015;7:32-9.
- Abas O, Abdelaziem F, Kilany A. Clinical spectrum of cerebral palsy and associated disability in south egypt: a local survey study. *Macedonian J Med Sci.* 2017 Feb 15;5(1):37.
- Rikonen R, Raumavirta S, Sinivuori E, Seppala T. Changing pattern of cerebral palsy in the south west region of Finland. *Acta Paediatr Scand.* 1989;78:581-7.
- Dobyns WB, Truwit CL. Lissencephaly and other malformations of cortical development: 1995 update. *Neuropediatrics.* 1995 Jun;26(03):132-47.
- Croen LA, Grether JK, Curry CJ, Nelson KB. Congenital abnormalities among children with cerebral palsy: more evidence for prenatal antecedents. *J Pediatrics.* 2001 Jun 1;138(6):804-10.
- Wichers MJ, van der Schouw YT, Moons KG, Stam HJ, van Nieuwenhuizen O. Prevalence of cerebral palsy in The Netherlands (1977-1988). *Eur J Epidemiol.* 2001;17:527-32.
- Sathiakumar N, Yakubu M. Cerebral palsy in Zaria, Northern Nigeria-is it preventable?. *J Trop Paedia.* 1987;33:263-5.
- Bhatia M, Joseph B. Rehabilitation of cerebral palsy in a developing country: the need for comprehensive assessment. *Pediatr Rehabil.* 2000;4:83-6.
- Odding E, Roebroek ME, Stam HJ. The epidemiology of cerebral palsy: incidence, impairments and risk factors. *Disabil Rehabil.* 2006;284:183-91.
- Surveillance of Cerebral Palsy in Europe (SCPE). Prevalence and characteristics of children with cerebral palsy in Europe. *Dev Med Child Neurol.* 2002;44:633-40.
- Serdaroglu A, Cansu A, Ozkan S, Tezcan S. Prevalence of cerebral palsy in Turkish children between the ages of 2 and 16 years. *Dev Med Child Neurol.* 2006;48:413-6.
- Kakooza-Mwesige A, Forssberg H, Eliasson AC, Tumwine JK. Cerebral palsy in children in Kampala, Uganda: clinical subtypes, motor function and co-morbidities. *BMC Res Notes.* 2015;23(8):166.

23. Ogunlesi T, Ogundeyi M, Ogunfowora O, Olowu A. Socio-clinical issues in cerebral palsy in Sagamu, Nigeria. *South Afr J Child Health.* 2008;2:120-4.
24. Paneth N, Rudelli R, Kazam E, Monte W. Brain damage in the preterm infant. Cambridge University Press; 1994 Jan 10.
25. Bax M, Tydeman C, Flodmark O. Clinical and MRI correlates of cerebral palsy: The European Cerebral Palsy Study. *JAMA.* 2006;296:1602-8.
26. Robinson MN, Peake LJ, Ditchfield MR, Reid SM, Lanigan A, Reddihough DS. Magnetic resonance

imaging findings in a population-based cohort of children with cerebral palsy. *Developmental Medicine Child Neurology.* 2009 Jan;51(1):39-45.

**Cite this article as:** Eyong KI, Asindi AA, Torty C. Aetiology and comorbidities of cerebral palsy in a developing country. *Int J Res Med Sci* 2018;6:3246-50.