Title: Review of cerebral palsy cases in the University of Nigeria Teaching Hospital, Ituku-Ozalla, Enugu.

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Abstract

Background: Cerebral palsy (CP) is a major cause of childhood disability. The objective of this study was to review the causes, types, complications, demographic and clinical characteristics of children with CP over a period of ten years as seen in the physiotherapy (PT) department of the University of Nigeria Teaching Hospital, Ituku-Ozalla Enugu, Nigeria.

Methods: A retrospective study that reviewed a total of 497 case folders of children with CP. Ethical clearance was obtained from the Health Research Ethics Committee of the University of Nigeria Teaching Hospital, Enugu. The case records were randomly selected, a data retrieval form developed through a two-stage process was used to obtain the required information. Data was analyzed using descriptive statistics and Chi-square tests. Level of significance was set at 0.05.

Results: Four hundred and ninety-seven cases of children with CP were reviewed. Birth asphyxia (29.9%) and jaundice (28.7%) were the leading causes of CP while spastic CP (56.7%) was the most common type. Motor disorder (67.0%) was the predominant clinical presentation. There was a significant association between type of CP and each of cause (X^2 =28.303, p = 0.001), and duration of PT treatment (X^2 =31.784, $p < 0.0001$).

Conclusion: It was concluded that Birth asphyxia and jaundice are the major cause of CP in this environment. There is a significant association between type of CP and the cause of CP as well as the duration of PT treatment received.

Keywords: Review; Cerebral Palsy; Hospital

Introduction

Cerebral palsy (CP) is an umbrella term covering a group of non-progressive but often changing motor impairment syndromes that are secondary to lesions or anomalies in the brain, arising in the early stages of development (Sankar et al., 2005). It is recognized as a chronic disorder of motion and postural balance caused by a defect or damage to the immature brain (Buljina et al., 1999). According to Badawi et al. (2005), CP is a major cause of childhood disability. It has been described as one of the three most common lifelong developmental disabilities, the other two being autism and mental retardation (Sankar et al., 2005). Cerebral palsy is a symptom complex rather than a disease and it often presents with unclear aetiology (Reddihough and Collins, 2003; Jacobsson and Hagberg, 2004). In many cases, a cause cannot be found in the history of children with clear clinical evidence of CP (Rosenbaum, 2003).

According to Stokes (1998), abnormalities could date from before birth (prenatal), or during birth (perinatal) but occurs after birth (postnatal) in the majority of CP cases. The diagnosis of CP is based on a history of abnormal motor development that is not progressive coupled with examination that helps in locating the specific site of the lesion in the brain (Russman and Ashwal, 2004). The observation of the form of CP, medical history of the mother and child and onset of the disorder can reveal the cause of CP (Nucleus Catalog Medical Reference Library, 2003). The main problem in all types of Cerebral Palsy is motor disorders accompanying with sensorial and cognitive problems (Tirosh and Rabino, 1989). The causes of motor disorders are; developmental retardation, abnormal muscle tone, muscle weakness, postural control deficiencies, sensorial problems, behavioral problems, orthopaedic problems, abnormal movement patterns and reflex activity, asymmetry and deformities (Styer-Acevedo, 1999).

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While in certain cases there is no identifiable cause, typical causes include problems in intrauterine development (e.g. infections, exposure to radiation), birth asphyxia, birth trauma, severe jaundice, meningitis and encephalitis during early childhood (Odding et al., 2006). Various risk factors have been linked to the occurrence and types of CP (Waugh et al., 1996; Hutton and Pharaoh, 2002).

There are many ways of classifying CP, this provides a framework in which to discuss the functional problems of individuals in their whole environment. CP can be spastic, dyskinetic, ataxic or mixed type. Anatomically, CP can be hemiplegic, diplegic, monoplegic, triplegic, quadriplegic or pentaplegic.

Children of teenage mothers or fathers were reported to be at risk of CP, and a significantly higher prevalence of CP was also reported in children whose mothers were 40 years or older, especially if such children were high in parity (Cummins et al., 1993). These authors also reported an increased prevalence of CP among children born to women of African origin. According to McCarthy (2002), the clinical patterns displayed in this non-progressive motor disability are determined by the position and extent of damage to the brain. The severity of the motor impairment and the associated cognitive communicative and behavioural impairments are different for each child with CP (Voorman et al., 2006). Cerebral palsy is usually classified based on motor disorder and the part in which the disorder is noticed (Hagberg and Hagberg, 1996; Singhi et al., 2002). The prevalence of CP is estimated at 2 - 2.5 cases per 1,000 live births (Nelson, 2003), while according to some studies it is a common neurodevelopmental condition and the most common paediatric neurological disorder accounting for about 50.3% of all cases seen in the clinics (Ogunlesi et al., 2008; Omole et al., 2013).

Cerebral palsy is recognized as a common childhood problem in Nigeria; however, most of the available data on CP in Nigeria are those generated from the limited area of practice of clinicians from various parts of Nigeria: Ibadan (Nottidge and Okogbo, 1991; Peters et al., 2008), Sagamu (Ogunlesi et al. 2008), Port Harcourt (Frank-Brigges and Alikor, 2011). The main focus of the present study is to review the profile of children with CP referred for physiotherapy within wider practice settings to the University of Nigeria Teaching Hospital.

Methods

Participants

The medical folders of children aged twelve years and below with cerebral palsy were reviewed for certain information at the physiotherapy department of the University of Nigeria Teaching Hospital. The purpose of the study was to review cerebral palsy cases at the University of Nigeria Teaching Hospital from the year 2007 to 2016. A total of 497 folders were reviewed.

Instruments

Data collection form

A data collection form otherwise known as a proforma, was used to gather information such as gender, age, place of the child in the family, caregiver, type of cerebral palsy, aetiology, complications, time of presentation, referral centres, length of hospital stay, physiotherapy referral, duration of treatment and discharge status, from the medical folders of the children.

Procedure

Ethical approval for the study was obtained from the University of Nigeria Teaching Hospital Health Research Ethics Committee. Permission was also obtained from the head of the physiotherapy department of the University of Nigeria Teaching Hospital where the study was conducted. The study was conducted retrospectively and medical folders of cerebral palsy

patients from the year 2007 to 2016 were assessed from the physiotherapy department of the University of Nigeria Teaching Hospital. Demographic and clinical information concerning the patients were obtained from the medical folders. The information from the folders were handled with utmost confidentiality.

Data analysis

Data generated from the medical folders were pooled for analysis. Data was analyzed using descriptive statistics and Chi-square tests Alpha level was set at 0.05. The data analyses were carried out using SPSS 21.0 version software (SPSS Inc., Chicago, Illinois, USA).

Results

As shown in table 1, most of the CP patients are males (57.9%) and were below three years old (86.4%). Birth asphyxia and jaundice were implicated in 58.6% of the cases with majority (83.3%) of the cases being referred from UNTH. Most (59.0%) of the patients had duration of physiotherapy treatment below 6 months with majority (71.8%) also receiving ten or a smaller number of treatment sessions. Spastic CP was the predominant type of CP having occurred in 56.7% of the cases.

Table 1: Frequency Distribution of selected variables of the samples (N = 497)

Variables	Categories	Frequency	Percentage (%)
Sex	Male	288	57.9
	Female	209	42.1
Age	<1year	217	43.8
	1.01-3.00years	211	42.6
	3.01-5.00years	32	6.5
	5.01-7.00years	16	3.2
	>7.00years	19	3.8
Aetiology	Jaundice	137	28.7
	Birth Asphyxia	143	29.9
	Seizure	91	19.0
	Others	107	22.4
Referral center	Unth	404	83.3
	Centres in Enugu	56	11.5
	Centres outside Enugu	25	5.2
Duration of Physiotherapy Treatment in Months	<6months	293	59.0
	6-12months	132	26.6
	13-36months	64	12.9
	>36months	8	1.6
Number of Treatment sessions	0-10	357	71.8
	11-20	82	16.5
	21-30	29	5.8
	31-40	15	3.0
	>40	14	2.8
Treatment Density(No. of treatment sessions per week)	1	440	90.7
	2	32	6.6
	3	9	1.9
	>3	4	0.8
Caregiver	Mother	381	76.7%
	Father	44	8.9%
	Mother and father	38	7.6%
	Others	34	6.8%
Type of cerebral palsy	Spastic	274	56.7%
	Athetoid	74	15.3%
	Ataxic	45	9.3%
	Mixed	90	18.6%
Physiotherapy discharge documented	No	459	92.4%
	Yes	38	7.6%

Key: Unth=University of Nigeria Teaching Hospital

As shown in figure 1, year 2007 has the highest CP cases (13.1%) and majority (67.0%) of the cases presented with motor disorder (figure 2).

Figure 1: ***Bar chart of the frequency distribution cerebral palsy cases from year 2007 to 2016***

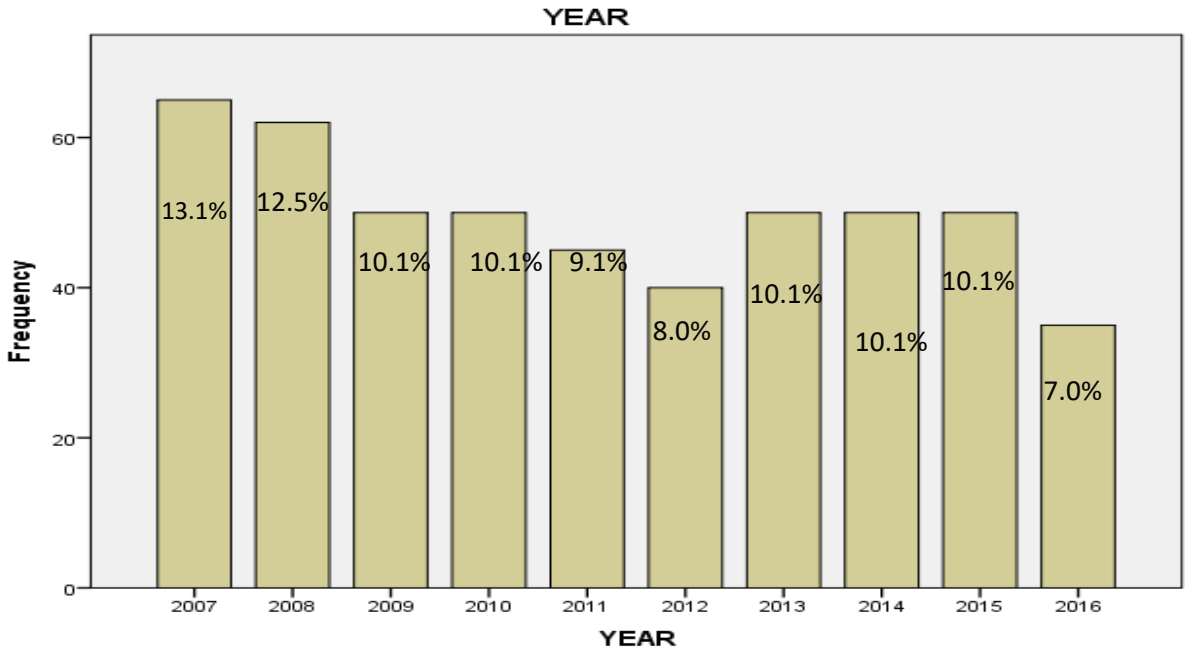
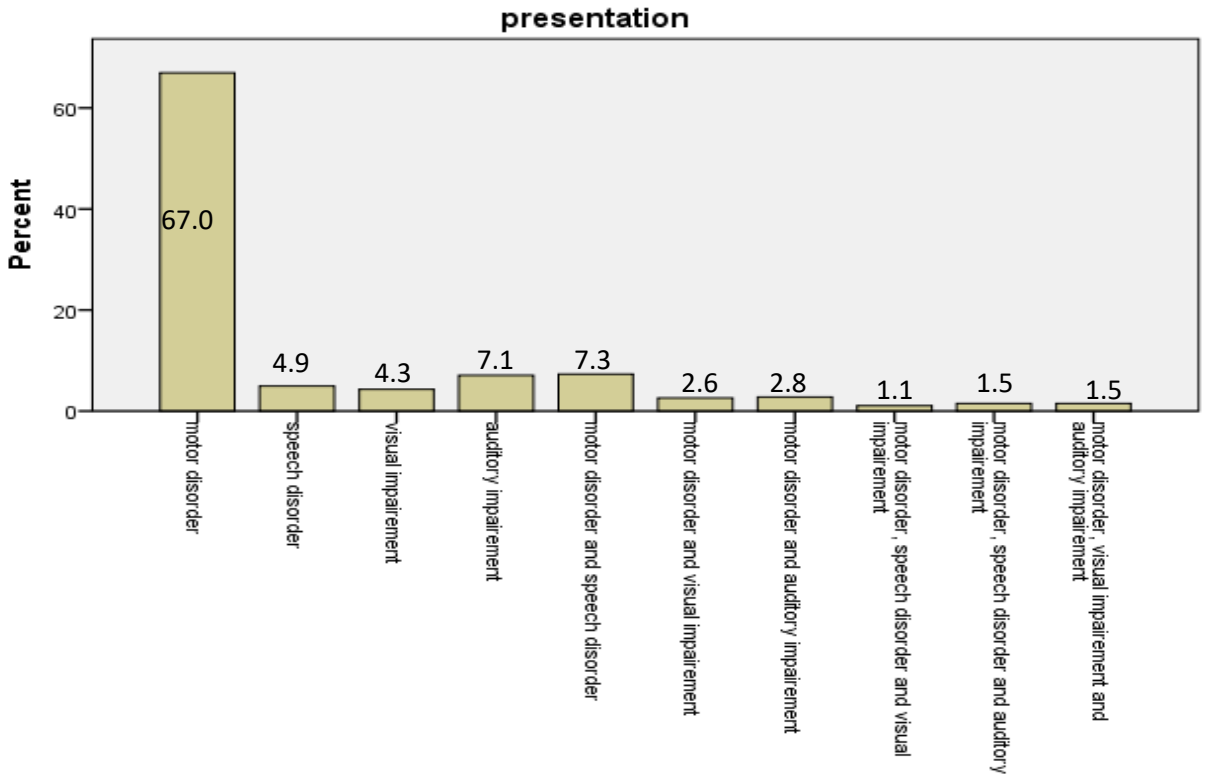


Figure 2: ***Bar chart showing percentage distribution of clinical cases of cerebral palsy children***



Athetoid and ataxic type of CP received more treatments monthly with both having 10.8% and 10.2% respectively of ≥2 treatment sessions per month. There was no significant association between type of CP and treatment density ($p>0.05$) as shown in table 2.

Majority (63.9%) of the spastic type of CP were caused by birth asphyxia and jaundice. There was a significant association between type of CP and cause of CP ($p<0.05$) as shown in table 3.

Mixed CP cases had higher PT treatment duration with 5.5% of the mixed CP cases receiving PT treatment for duration of ≥ 36 months. A significant association exists between the type of CP treatment and duration of PT treatment ($p<0.05$) as shown in table 4.

Majority (61.8%) of the CP cases which occurred in children who were first in their family had birth asphyxia and jaundice as its cause. A significant association was discovered between the cause of CP and position of the child in the family ($p<0.05$) as shown in table 5.

Table 2: Association between type of cerebral palsy and treatment density (N = 473)

Treatment density	Spastic type	Athetoid type	Ataxic type	Mixed type	Total	X^2	p-value
1	241	66	42	79	428(90.5%)	9.444	0.397
2	20	7	0	5	32(6.8%)		
3	4	1	2	2	9(1.9%)		
>3	2	0	0	2	4(0.8%)		
Total	267(56.4%)	74(15.6%)	44(9.3%)	88(18.6%)	473(100%)		

Table 3: Association between type of cerebral palsy and cause of cerebral palsy (N = 470)

Variables	Spastic	Athetoid	Ataxic	Mixed	Total	X^2	p-value
Jaundice	80	21	13	21	135(28.7%)	28.303	0.001*
Birth Asphyxia	90	14	13	25	142(30.2%)		
Seizure	56	10	3	19	88(18.7%)		
Others	40	29	13	23	105(22.3%)		
Total	266(56.6%)	74(15.7%)	42(8.9%)	88(18.7%)	470(100.0%)		

Table 4: Association between type of cerebral palsy and duration of physiotherapy treatment (N = 483)

Variables	Spastic	Athetoid	Ataxic	Mixed	Total	X^2	p-value
<6 months	176	40	31	36	283(58.6%)	31.784	<0.0001
6-12 months	58	23	10	37	128(26.5%)		
13-36 months	39	10	3	12	64(13.3%)		
>36months	1	1	1	5	8(1.7%)		
Total	274(56.7%)	74(15.3%)	45(9.3%)	90(18.6%)	483(100.0)%		

Table 5: Association between cause of cerebral palsy and the position of the child in the family (N = 474)

Variables	Jaundice	Birth asphyxia	Seizure	Others	Total	X^2	p-value
1st child	53	62	28	43	186(39.2%)	60.719	<0.0001*
2nd child	33	32	26	20	111(23.4%)		
3rd child	33	25	25	11	94(19.8%)		
4th child	8	7	7	20	42(8.9%)		
5th child	5	6	2	9	22(4.6%)		
Others	4	10	2	3	19(4.0%)		
Total	136(28.7%)	142(30.0%)	90(19.0%)	106(22.4%)	474(100%0		

Discussion

Demographic characteristics of the participants

The study had more male children with CP (insert specific percentage). This is consistent with previous findings (Ayanniyi, O & Abdulsalam, K) who reported that out of 213 children with CP, 126(59.2%) were male and 57% of them were less than 2 years. However, this is at variance with the findings of Buljina et al. (1999) on two hundred and thirteen children with CP, aged 18 months to 12 years, who reported an insignificant gender difference in children with CP in their study. Also, majority of the children were below five years, and this is in consonance with the earlier reports by Ibeziako and Ibekwe, (2002).

Position of children with cerebral palsy in the family

Many of the children in this study were in the first to third born position of their family. This range of birth order does not fall within the high parity range that has been implicated as a probable cause of CP, which may be prenatal, perinatal or postnatal (Cummins et al. 1993). According to Cummins et al. (1993), a high number of parities is a risk factor for CP and not low parity as witnessed in the present study. However, this finding is consistent with that of Ogunlesi et al. (2008), who implicated poor maternal health care during pregnancy and after delivery as a possible reason for high cases of CP in low parity children. Hence, there is a need for sustained health care education for women of child bearing age to make them aware of the importance of

pre- and post-natal care in the control and prevention of factors that may predispose the developing foetus and new-born baby to CP.

Reported Causes of Cerebral Palsy

Perinatal events (asphyxia, jaundice and seizures) are the leading causes of CP among the cases reviewed in the present study, which according to Ogunlesi et al. (2008) is a problem in resource-poor settings like Nigeria. This finding is consistent with previous findings from different parts of Nigeria: Zaria North Central (Sathiakumar and Yakubu, 1987); Ibadan and Sagamu Western Region (Lagunju et al., 2006; Ogunlesi et al., 2008; Hamzat and Fatudimu, 2008); and Port Harcourt S South-South Region (Frank- Briggs and Alikor, 2011) where the problem of CP has been linked to poor maternal care from incompetent care-givers. However, this is at variance with the report of a predominance of brain infections from India (Gangil et al., 2001; Singhi et al., 2002) and problems of low birth weight from the Netherlands (Odding et al., 2006) and Saudi Arabia (al-Rajeh et al., 1991). In the present study, asphyxia was reported as the major causative factor of CP among the cases reviewed. This is consistent with the finding of Nottidge and Okogbo (1991), but at variance with others (Ogunlesi et al., 2008; Frank-Briggs and Alikor, 2011) who reported jaundice as the predominant cause of CP followed by asphyxia in their studies. With respect to CP caused by asphyxia as found in this study and others, Ogunlesi et al. (2008) opined that this may be related to the high rate of poorly supervised deliveries, as has been demonstrated previously (Thomberg et al., 1995). This is most relevant in developing countries where available health care facilities are over-stretched. Proactive measures are therefore needed to strengthen maternal care in other to curtail perinatal causes of CP.

Types of cerebral palsy and clinical presentations

The most observed type of CP was the spastic type (56.7%) which is similar to that reported by other studies (Odding et al., 2006; Hamzat and Fatudimu, 2008; Ogunlesi et al., 2008; Frank-Briggs and Alikor, 2011), with motor disorders (67.0%) dominating as the most common clinical presentation and is consistent with findings in some previous studies (Singhi et al., 2002; Hamzat et al., 2008; Peters et al., 2008; Frank- Briggs and Alikor, 2011).

Presentation of a combination of co-morbidities like motor disorder plus speech disorder (7.3%) and motor disorder plus auditory impairment (2.8%) also featured frequently in the present study which is in line with previous findings (Nottige and Okogbo, 1991; Ogunlesi et al., 2008; Frank-Briggs and Alikor, 2011). According to Ogunlesi et al.,(2008), the factors responsible for the differences observed in the distribution of different specific co-morbidities in different places is difficult to explain.

Ogunlesi et al., (2008) also reported that children with CP who suffered from both jaundice and asphyxia have been noted to present with more severe cases of CP. Therefore, stringent efforts should be made to prevent such occurrences. In the present study, a strong association was found between the type of CP and cause of CP, which is consistent with the findings is some other studies (Drummond and Clover, 2002; Pharoah et al., 1998; Stoknes et al., 2012). No association was established between the type of cerebral palsy and treatment density. But an association was found between position of child in the family and cause of CP. This suggests that birth order may be a strong contributing factor for development of CP. However, the type of CP shows strong association with other variables such as duration of physiotherapy treatment and referral center. This observed association may have implications for the management of children with CP (Lao and Ho, 1997; Olausson et al., 1999).

Limitations

A major limitation of the study was its restriction to the University of Nigeria Teaching Hospital, Ituku-ozalla Enugu. Therefore, the findings cannot be generalized automatically to the whole Nigeria and other countries.

Clinical implications of findings

It can be inferred from this study that the major causes of CP in the University of Nigeria Teaching Hospital are attributable to perinatal events (asphyxia, jaundice and seizures), all of which can be minimized by adequate ante-natal care. Concerted efforts must be made by all concerned stakeholders from the national to the grassroots level to embark on serious advocacy to raise national awareness on the problem of CP in Nigeria. To this end necessary mechanism must be put in place to inform and educate people on the causes and prevention of this lifelong source of childhood disabilities.

Conclusion

Cerebral palsy in University of Nigeria Teaching Hospital is mainly associated with asphyxia and jaundice, while the most prevalent type of cerebral palsy was the spastic type with motor disorder presentation dominating.

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References

al-Rajeh S., Bademosi O., Awaola A., Ismail H., al-Shamnasi S., and Dawodu A. 1991. Cerebral palsy in Saudi Arabia: A casecontrol study of risk factors. *Developmental Medicine and Child Neurology* 33: 1048-1052.

Badawi N., Felix J.F. and Kurinczuk J.J. 2005. Cerebral palsy following term newborn encephalopathy; A population based study. *Developmental Medicine and Child Neurology* 47: 92.

Boskabadi H., Omidian M. and Mafinejad S. 2010. Prevalence and clinical manifestation of glucose-6-phosphate dehydrogenase deficiency in newborns with hyperbilirubinemia in Mashhad, Iran. *Macedonian Journal of Medical Sciences* 3(4): 383-387.

Buljina A., Zubcevic S., Uzicanin S. and Heljic S. 1999. The role of risk factors in developmental diagnosis. *Medicinski Archiv*

53(3 suppl. 2): 5–8.

Cummins S.K., Nelson K.B. and Grether J.K. 1993. Cerebral palsy in four northern California counties, births 1983 through 1985.*Journal of Pediatrics* 123: 232-237.

Drummond P.M. and Colver A.F. 2002. Analysis by gestational age of cerebral palsy in singleton births in North-East England 1970–1994. *Paediatric Perinatal Epidemiology* 16(2): 172–180.

Fagbule D, Joiner KT. Pattern of childhood mortality at the University of Ilorin Teaching Hospital. *Niger J Pediatr 1987; 14: 1 5.*

Frank-Briggs A.I. and Alikor E.A.D. 2011. Sociocultural issues and causes of cerebral palsy in Port Harcourt, Nigeria. *Nigerian Journal of Paediatrics* (3): 115-119.

Gangil A., Patwari A.K., Areja S., Ahuja B. and Anand V.K. 2001. Feeding problems in children with cerebral palsy. *Indian Pediatrics* 38: 839–846.

Hagberg B. and Hagberg G. 1996. The changing panorama of cerebral palsy — Bilateral spastic forms in particular. *Acta Paediatrica* Suppl 416: 48-52.

Hamzat T.K. and Fatudimu M.B. 2008. Caregivers or care providers: Who should assess motor function in cerebral palsy? *Journal of Pediatric Neurology* 6: 345-350.

Hutton J.L. and Pharoah P.O. 2002. Effects of cognitive, motor and sensory disabilities on survival in cerebral palsy. *Archives of Disease in Childhood* 86(2): 84-89.

Ibeziako SN, Ibekwe RC. Pattern and outcome of admissions in the children's emergency room of the University of Nigeria Teaching Hospital, Enugu. *Niger J Pediatrics 2002; 29: 103-107*

Jacobsson B. and Hagberg G. 2004. Antenatal risk factors for cerebral palsy. *Best Practice and Research Clinical Obstetrics and Gynaecology* 18(3): 425–436.

Lao T.T. and Ho L.F. 1997. The obstetric implications of teenage pregnancy. *Human Reproduction* 1997; 12(10): 2303-2305.

McCarthy G.T. 2002. Cerebral palsy, the clinical problem. In: Squire, W. ed. Acquired damage to the developing brain: Timing and causation. London; Arnold, p.14.

Nelson K.B. 2003. Can we prevent cerebral palsy? *New England Journal of Medicine* 349:1765-9

Nottidge V.A. and Okogbo M.E. 1991. Cerebral palsy in Ibadan. *Nigeria Developmental Medicine and Child Neurology* (33): 3, 241–245.

Odding E., Roebroeck M.E. and Stam H.J. 2006. The epidemiology of cerebral palsy: Incidence, impairments and risk factors.*Disability and Rehabilitation* 28(4): 183-191.

Ogunlesi T., Ogundeyi M., Ogunfowora O., Olowu A. 2008. Socio-clinical issues in cerebral palsy in Sagamu, Nigeria. *South Africa Journal of Child Health* 2(3): 120-124.

Olausson P.O., Cnattingius S. and Haglund B. 1999. Teenage pregnancies and risk of late fetal death and infant mortality. *British Journal of Obstetrics and Gynaecology* 106(2): 116- 121.

Omole J.O., Olaogun M.O.B. and Mbada C.E. 2013. Pattern of neurological conditions seen at the outpatient paediatric physiotherapy. *Journal of Exercise Science and Physiotherapy* 9(2): 105-112.

Peters G.O., Adetola A. and Fatudimu M.B. 2008. Review of paediatric neurological conditions seen in the physiotherapy department of a children's hospital in Ibadan, Nigeria. *African Journal of Biomedical Research* (11): 281–284.

Pharoah, P.O., Cooke, T., Johnson, M.A., King, R. and Mutch, L. Epidemiology of cerebral palsy in England and Scotland, 1984 – 9. *Archive of Disability Child Fetal Neonatal edition* 1998; 79(1): F21-5.

Reddihough D.S. and Collins K.J. 2003. The epidemiology and causes of cerebral palsy. *Australian Journal of Physiotherapy* 49(1): 7-12.

Rosenbaum P. 2003. Cerebral palsy: what parents and doctors want to know. *British Medical Journal* 326: 970-997.

Russman B.S. and Ashwal S. 2004. Evaluation of the child with cerebral palsy. *Seminars in Pediatric Neurology* 11(1): 47-57.

Sankar C. and Mundkur N. 2005. Cerebral palsy — definition, classification, etiology and early diagnosis. *India Journal of Paediatrics* 72: 864-868.

Sathiakumar N. and Yakubu M. 1987. Cerebral palsy in Zaria, Northern Nigeria – Is it preventable? *Tropical Paediatric* 33: 263–265.

Singhi P.D., Ray M., and Suri G. 2002. Clinical spectrum of cerebral palsy in North India – An analysis of 1000 cases. *Journal of Tropical Pediatrics* 48(3): 162-166.

Stokes M. 1998. *Neurological Physiotherapy*. London: Mosby International Limited. Nucleus Catalog Medical Reference Library. 2003. Cerebral palsy overview. www.catalog.nucleusine.com. Accessed 28 November 2015.

Stoknes M., Andersen G.L., Elkamil A.I., Irgens L.M., Skranes J., Salvesen K.Å. and Vik T. 2012. The effects of multiple pre- and perinatal risk factors on the occurrence of cerebral palsy. A Norwegian register-based study. *European Journal of Paediatric Neurology* 16(1): 6-63.

Styer-Acevedo, J. (1999). Physical Therapy for the Child with Cerebral Palsy, In: *Pediatric Physical Therapy*, 3rd ed., J. S. Tecklin, 107-162, Lippincott Williams & Wilkins, 0-7817-5399-6, Philadelphia.

Thomberg E., Thiringer K., Odeback A. and Milsom I. 1995. Birth asphyxia: An incidence, clinical course and outcome in a Swedish population. *Acta Paediatrica* 1995; 84: 927-932.

Tirosh, E., Rabino, S. (1989). Physiotherapy for Children with Cerebral Palsy. Evidence for its Efficacy. *American Journal of Diseases of Children.* 143:5, 552–555, 0002-922X.

Voorman J.M., Dallmeijer A.J., Schuengel C., Knol D.L., Lankhorst G.J. and Becher J.G. 2006. Activities and participation of 9- to 13-year old children with cerebral palsy. *Clinical Rehabilitation* 20:937-948.

Waugh, J., O'Callaghan, M.J., Tudehope, D.I., Mohay, H.A., Burns, Y.R., Gray, P.H. and Roger, Y.M. 1996. Prevalence and aetiology of neurological impairment in extremely low birth weight infants. *Journal of Paediatric and Children Health* 32(2): 120-124.