International Journal of Biomedical Investigation

Available Online: https://ijbi.edwiserinternational.com

Investigation of Clinical and Diagnostic Features Associated with Cerebral Palsy Children in a Tertiary Health Facility in Nigeria

Lekpa K. David[1] and Willy B. Vidona[2,]*

[1]Department of Anatomy, University of Port Harcourt, Rivers State, Nigeria
[2]Department of Anatomy, Edo State University Uzairue, Edo State, Nigeria

Article info

Received 03 May 2021
Revised 07 June 2021
Available Online 30 June 2021

*Corresponding author: Dr. Willy B. Vidona, Department of Anatomy, Edo State University Uzairue, Edo State, Nigeria

Abstract

Background: *Cerebral palsy is non-progressive motor disability syndrome largely attributed to abnormal development or damage from likely trauma in one or more parts of the brain especially the cerebellum and frontal lobe of the cerebrum that control muscle tone and motor activity and causing variable mental, motor and behavioral dilemmas generally referred to as delayed developmental milestone.*

Aims and Objectives: *The study aims to investigate the gross features and clinical manifestation in cerebral palsy children in in cross-sectional patients in health facility.*

Materials and Methods: *The study involved the use of 40 case files of cerebral palsy patients; 26 (65. 0%) out of them were girls, and 14 (35.0%) of them were boys, aged from 0 to 10 years old.*

Results: *The main clinical presentation in this study was speech delay which was presented in 50.0% of the examined children, followed by delayed walking and movement in 25.0% of the patients. Analysis using records of imaging diagnostic tools showed that computed tomography has the highest case file with 70.0% due its availability and its cheapness compared to magnetic resonance imaging.*

Conclusion: *Children with cerebral palsy are best cared for with an individualized treatment plan that provides a combination of interventions tailored to each individual.*

Keywords: *Cerebral palsy; Imaging diagnostics; Motor disability; Muscle tone; Delay milestone; Pediatrics; Incidence*

Introduction

Cerebral palsy is a common disorder of children with noticeable physical and gross motor weakness. It is said to be a damage done to the brain structure involved either pre, during and after birth [1] and obvious manifestation from early childhood. The term is used to describe a group of chronic conditions affecting body movements, posture and muscle coordination, including activity limitation that are attributed to nonprogressive disturbances [2] that occurred in the developing fetal or immature brain. Cerebral palsy is also known as a group of permanent movement disorders that appear in early childhood [3,4]. Cerebral palsy is, in fact, a clinical presentation of a wide variety of cerebral cortical or sub-cortical insults occurring during the first year of life. The vulnerable brain is harmed during a critical period of development primarily by known central nervous system complications of prematurity such as intraventricular hemorrhage.

Causes of cerebral palsy

Cerebral palsy is caused by damage to one or more specific areas of the brain such as the cerebellum that

control muscle tone and frontal lobe of the cerebrum that control motor activity and causing variable mental, motor and behavioral dilemmas and thus primarily called a neuromotor disorder. Some other causes of cerebral palsy is congenital in which case the affected children are born with it or in complications during labor that caused asphyxia common due to the stress of labor and delivery during birth estimated in about 5%-10% [5], although it may not be detected until months or years later. Although newborn's blood is equipped to compensate for short-term low levels of oxygen, if the supply of oxygen is reduced for lengthy periods, an infant can develop a type of brain damage called hypoxic-ischemic encephalopathy, which destroys tissue in the cerebral motor cortex and other areas of the brain. This kind of damage can also be caused by severe maternal low blood pressure, rupture of the uterus, detachment of the placenta, or problems involving the umbilical cord [6,7].

Other causes are damage to the white matter of the brain, a condition known as periventricular leukomalacia that interfere with the normal transmission of signals within the brain and body likely due to maternal or fetal infection. Also, an interruption of the normal process of brain growth during fetal development known as cerebral dysgenesis can cause brain malformations that interfere with the transmission of brain signals as well which is particularly vulnerable during the first 20 weeks of development likely due to gene mutation. Intracranial hemorrhage due to fetal stroke from blood clots in the placenta that block blood flow or weak blood vessels in the brain or even maternal high blood pressure as well as maternal infection [8]. Between 40% and 50% of all children who develop cerebral palsy were born prematurely [9], of which most of these cases (75-90%) are believed due to issues that occur around the time of birth, often just after birth [10], which likely is parts of the risk factors [11]. Multiple-birth infants are also more likely than single-birth infants to have cerebral palsy [12] which is also another risk factor. While in certain cases there is no identifiable cause, typical causes include problems in intrauterine development infection, fetal growth restriction), hypoxia of the brain (thrombotic events, placental conditions), birth trauma during labor and delivery, and complications around birth or during childhood [13].

Signs and symptoms of cerebral palsy

It is observed that the signs of cerebral palsy are usually not noticeable in early infancy but become more obvious as the child's nervous system matures and the problems and disabilities could range from very mild to very severe depending on the severity of the brain damage. They may be very subtle, noticeable only to medical professionals, or may be obvious to the parents and other caregivers. Signs and symptoms vary among people and over time. According to Rosenbaum et al., the motor disorders of cerebral palsy are often accompanied by disturbances of sensation, perception, cognition, communication, and behavior, by epilepsy, and by secondary musculoskeletal problems [14]. In fact children with cerebral palsy suffer from multiple problems and potential disabilities that require the provision of family-centered services that make a difference in the lives of these children and their families [15].

Diagnosis of cerebral palsy

The diagnosis of cerebral palsy has historically rested on the child's history and physical examination. A general movement's assessment which involves measuring movements that occur spontaneously among those less than four months of age, appears most accurate [16]. Children who are more severely affected are more likely to be noticed and diagnosed earlier [17]. Symptoms and diagnosis typically occur by the age of 2 [18] although children with milder forms of cerebral palsy may be over the age of 5, if not in adulthood, when finally diagnosed. Early diagnosis and intervention are seen as being a key part of managing cerebral palsy [19]. Early detection and diagnosis is critical since it allows medical practitioners to begin treatment when the disorder is in its initial stages. Once a person is diagnosed with cerebral palsy, further diagnostic tests are optional. Neuroimaging with Computed Tomography (CT) or Magnetic Resonance Imaging (MRI) is warranted when the cause of a person's cerebral palsy has not been established. An MRI is preferred over CT, due to diagnostic yield and safety. When abnormal, the neuroimaging study can suggest the timing of the initial damage [20,21].

The challenges of management of cerebral palsy begin from diagnosis to the provision of care long after diagnosis. The ability to provide a diagnosis for the disorder early in the child's life may determine the success of treatment process.

Materials and Method

Research design

This research is a retrospective study and investigative survey on cerebral palsy children using case files of previously admitted patients with cerebral palsy that

visited the radiology and pediatric department of the Rivers State University Teaching hospital.

Population for the study

The inclusion criteria for population for this study was all children of less than 10 years old diagnosed with cerebral palsy within year 2020. Children above the age of ten years that probably visited other departments within the hospital were reviewed and hence excluded from the population sample size of 40 case files investigated.

Method of data collection and analysis

Data was acquired by reviewing previous patient's folders with cerebral palsy in the radiology and pediatric department with focus on historical structural features of symptoms and clinical diagnosis with reference to radiological findings made with support from the technical staff on ground. The data collected were analyzed using Microsoft excel 2010 version 8

Data Presentation and Results

Table 1: Distribution of cases according to gender.

Gender	No. of cases	Percentage (%)
Male	14	35.0
Female	26	65.0
Total	40	100%

This table shows the frequency distribution of pediatrics according to gender, 35.0% (28) were males and 65.0% (44) were females.

Table 2: Distribution of cases according to age in years.

Age (Years)	No. of cases	Percentage (%)
< 1- 1	5	12.5
2 – 4	12	30.0
5 – 7	16	40.0
8 – 10	7	17.5
Total	40	100

The above shows the age distribution of Cases According to years, Pediatrics with highest number of cerebral palsy were between 5 to 7 years with a frequency of 16 (40.0%), while the least is less than 1 years with 5 (12.5%).

Table 3: Specific Clinical Signs of cerebral palsy Children.

Clinical signs	No. of cases	Percentage (%)
Speech Delay	22	55.0
Delayed Milestone/ Hypertonia	8	20.0
Delayed Movement and Walking	10	25.0
Total	40	100

Table 3, illustrates the common clinical signs exhibited by cerebral palsy patients with delayed speech been the highest 22(55.0%) while delayed milestone/hypertonia being the least 8(20.0%) clinical sign.

Table 4: Imaging Diagnosis of Cerebral Palsy in Pediatrics.

Imaging technique	No. of cases	Percentage (%)
Magnetic Resonance Imaging (MRI)	12	30.0
Computed tomography (CT)	28	70.0
Ultrasound Scan (US)	0	0
Total	40	100%

Table 4 describes the most commonly used imaging techniques in diagnosis of CP, CT has the highest rate of usage with frequency of 28(70.0%) while MRI was least used with a frequency of 12 (30.0%).

Discussion

The presented study revealed that females are affected more than males, which may likely be due to the increased female birth rate recorded in addition a possible lower birth weight associated with the female children during period under review in the health

facility. However, a study [22] claimed that female sex tends to be lower with an explanation that sex hormones protect the female fetal brain from hypoxia and less predisposed to cerebral palsy compared to the males, even though the reason for this disparity with regards to the very hormone is still being researched upon.

The age range of five to seven years was observed to having the highest rate of cerebral palsy which was of older age range probably due to the low percentage of data on earlier consultation and diagnosis from lack of comprehensive awareness. This was very closely followed by age range of two to four years old which is usually attributed to advise from medical practitioners at birth time that good clinical evaluation of signs and symptoms are more accurate at this age hence the likely delay for early examination and detection. This observations were different when compared to other studies [23] where incidences are recorded quite earlier likely due to an informed and educated populace.

Obvious gross motor delay, poor head control, spasticity and decreased reflex were the revealed signs in patients on relative basis among different patients from observation from record history. However, the pronounced, reoccurring clinical presentation in this study as observed from clinically examined records was speech delay was presented in (50.0%) of the examined children, followed by delayed walking and movement in 25.0% of patients which were very noticeable due to age range of children available for examination.

Selected investigations are essential to confirm the diagnosis of children with cerebral palsy, especially on the basis of clinical manifestation [24] when examined at a very early age, and early neuroimaging is known to be very necessary to access the degree of brain pathology, identify the etiology, and to assess the prognosis even as asserted by Lauric [25]. With the prevailing disadvantage capacity of the health facility, the commonest imaging technique used in this study was computed tomography with (70.0%), which was due to the fact that computed tomography is readily available and cheaper in a developing nation like where this study was carried out compared to MRI as also agreed by Khajik and Saad on high prevalence investigation by computed tomography. Moreover, computed tomography in the present study was abnormal in most of the cases (28 in number) of both sexes [26]. However, patients with cerebral palsy might present clinically with normal brain computed tomography scan thus magnetic resonance imaging is carried out to obtain further accuracy.

Conclusion

Cerebral palsy is a chronic motor disorder that is said to affect the parts of the brain, with unknown cause in most cases although birth trauma and prematurity remains the commonest risk factor. Children with cerebral palsy suffer from multiple problems and potential disabilities among which are abnormal muscle tone, delayed motor development, and delayed speech all classified as delayed developmental milestones. Screening for these conditions should be part of the initial assessment for proper attention and care which is more effective on an individualized treatment plan that provides a combination of interventions and that requires the provision of a number of family centered services so as to improve the quality of life through a coordinate a complex care system that maximize the capabilities and benefits of the child.

Recommendation

It is recommended that computed tomography of the brain (when MRI was not available) be the least to deployed in suspected cases of cerebral palsy to establish any brain abnormality. Further metabolic and genetic tests are recommended to exclude underlying genetic or metabolic etiology especially those with malformations. Those with focal vascular insult, coagulation studies are recommended to exclude coagulopathy.

Cerebral palsy is non- curable in the accepted sense although several measures such as proper education, therapy and applied technology are being used to help persons who are suffering from this disorder and provide them productive lives. In order to approach cerebral palsy systematically, the medical practioners and physical therapists need to recognize neuromotor deficits, diagnose and implement a methodical treatment plan.

Ethics Approval and Consent to Participate

Consent not required for as only records were used.

Consent for Publication

Not applicable.

Availability of Data and Material

The datasets generated during and/or analyzed during the current study are available in the Rivers State University teaching hospital database.

Competing Interests

None.

Funding

This study was not supported by any agency.

Authors' Contributions

Each author contributed adequately. LD contributed in data collection. WV contributed in data interpretation and analysis. All authors read, edited and approved the manuscript.

Acknowledgements

We acknowledge Mrs. Charity Willy-Vidona and Mrs. Courage Lekpa David for their support, love and encouragement.

References

1. Beukelman R, David MP. Augmentative and Alternative Communication: Management of severe communication disorders in children and adults (2nd ed.). Baltimore: Paul H Brookes Publishing Co. 1999; 246-249.
2. Kumari AM, Yadav S. Cerebral Palsy: a mini review. Int J Therap Application 2012; 3: 15-24.
3. Jahangir MA, Anand C, Muheem A, et al. Nano Phytomedicine Based Delivery System for CNS Disease. Current Drug Metabolism 2020.
4. Haak P, Lenski M, Hidecker MJC, et al. Cerebral palsy and aging. Develop MedChild Neurol2009; 51: 16-23.
5. Pharoah PO. Causal hypothesis for some congenital anomalies. Twin Res Hum Genet 2005; 8: 543-550
6. Muheem A, Jahangir MA, Jaiswal CP, et al. Recent patents, regulatory issues, and toxicity of nanoparticles in neuronal disorders. Current Drug Metabolism 2021.
7. Lindquist BH. Bruxism in children with brain damage. Acta Odontal Scandinavian 1999; 32: 313-319.
8. Tanaka A, Araki JI, Tasaki AM. Improvement of hypertonus after treatment for sleep disturbances in three patients with severe brain damage. Brain Dev 1997; 19: 240-244.
9. William B, Carey D. Developmental-behavioral pediatrics (4th ed.). Philadelphia, PA: Saunders/Elsevier 2009; 264.
10. John Y. Epidemiology and Disease Prevention: A Global Approach (02 ed.). Oxford University Press 2013; 190.
11. Eunson P. Aetiology and epidemiology of cerebral palsy. Paediat Child Health. 2016; 26: 367-372.
12. Saunders NR, Hellmann J, Farine D. Cerebral palsy and assisted conception. J Obstetrics Gynaecology Canada 2011; 33: 1038-1043.
13. Nelson KB, Blair E. Prenatal Factors in Singletons with Cerebral Palsy Born at or near Term. NEJM. 2015; 373: 946-953.
14. Rosenbaum P, Paneth N, Leviton A. A report: the definition and classification of cerebral palsy April 2006. Dev Med Child Neurol 2017; 109: 8-14.
15. King S, Teplicky R, King G, et al. Family centered service for children with cerebral palsy and the families: a review of the literature. Semin Pediatr Neurol 2004; 11: 78-86.
16. McIntyre S, Morgan C, Walker K, et al. Cerebral palsy don't delay. Develop Disabilities Research Reviews 2011; 17: 114-129.
17. Bosanquet M, Copeland L, Ware R, et al. A systematic review of tests to predict cerebral palsy in young children. Dev Med Child Neurol 2013; 55: 418-426.
18. Lungu C, Hirtz D, Damiano D, et al. Report of a workshop on research gaps in the treatment of cerebral palsy. Neurology 2016; 87: 1293-1298.
19. Graham DP, Simon P, Wimalasundera N. Current thinking in the health care management of children with cerebral palsy. Medical J Australia 2019; 210: 129-135.
20. Mohanty D, Rani MJ, Haque MA, et al. Preparation and evaluation of transdermal naproxen niosomes: formulation optimization to preclinical anti-inflammatory assessment on murine model. J liposome Research 2020; 30: 377-387.
21. Kolawole PJ, Patel AHM. Computed tomographic (CT) scans in cerebral palsy (CP). Pediatr Radiol 1999; 20: 23-25.
22. Johnston M, Hagberg H. Sex and the pathogenesis of cerebral palsy. Dev Med Child Neurol; 2007; 49: 74–78.

23. Al-Khalidi M. Clinical Presentations and CT scan Findings in Children with Cerebral Palsy. Iraqi J Comm Med 2009; 1: 40-47.
24. Aneja S. Evaluation of child with cerebral palsy. Indian J Pediatrics 2004; 7: 627-634.
25. Lauric B. New AAN Practice Guidelines for evaluating children with Cerebral Palsy. Neurology 2004; 62: 851-853.
26. Khajik SY, Saad KK. Children and Cerebral Palsy: The Hopeful Clinical and Neuro-Imaging Impacts of Joint Therapy. EC Nutrition 2017; 11: 176-182.

This manuscript was peer-reviewed
Mode of Review: Single-blinded
Academic Editor: Dr. Mohamad Taleuzzaman