A STUDY OF CLINICO ETIOLOGICAL PROFILE OF CHILDREN WITH CEREBRAL PALSY IN A TERTIARY CARE CENTRE

Chaitanya Jyothi Ravula
Department of Pediatrics[1]

Sirisha Kankala
Department of Pediatrics[1]

Aparna Alladi
Department of Pediatrics[1]

Prasanna Lakshmi Thotada
Department of Pediatrics
Government General Hospital
Unnamed Road, Suryapet, Telangana, India, 508213

Santhimayee Kalivela✉
Department of Pediatrics[1]
santhimbbs.mayee@gmail.com

[1]*Niloufer Hospital/Osmania medical College*
Koti, Hyderabad, Telangana, India, 500095

✉**Corresponding author**

Abstract

The clinical spectrum of Cerebral palsy (CP) can differ in various places depending upon the knowledge of the people and resources for prevention, diagnosis and management. Although studied extensively in high-resource countries, adequate data related to CP from resource-constraint settings are lacking.

The aim: The present study is a descriptive study done on clinical profiles, aetiology, and comorbidities.

Materials and methods: Present study is a hospital-based descriptive study of 80 children with Cerebral Palsy from January 2020 to June 2021 (18 months) admitted to Niloufer Hospital for Child Health, cases chosen as per inclusion criteria guided by «The Definition and classification of cerebral palsy, April 2006 International consensus». Clinical history and clinical examination and necessary investigations using a systematically designed proforma.

Results: The most common types were spastic type (78.9 %) and hypotonic type (12.5 %). Spastic quadriparesis (55 %) was the most common among subtypes. Males were more affected than females, with more rural than urban distribution. 48.8 % belonged to the lower middle and 37.5 % to the upper lower class of socio-economic status. Consanguinity was observed in 33 %, and 3 % had a similar family history. A high incidence (65 %) was seen in firstborn children. Term gestation was commonest at 87 % and pre-maturity at 13 %. 91.3 % of the cases were institutional deliveries. For causes of cerebral palsy, 45 % required resuscitation at birth, 2.5 % had neonatal sepsis, 1.25 % had a cerebral malformation, 7.5 % had an intracranial bleed, 7.5 % had post-meaning encephalitic sequelae, 1.3 % had TORCH infection. Comorbidities Like mental retardation were seen in 90 %, seizure disorder in 87.5 %, visual problems in 24.8 %, hearing problems in 13.75 %, 56.25 % of cases were malnourished.

Conclusions: Comorbidities are significantly observed in cases of cerebral palsy. Appropriate screening and management of comorbidities, especially vision, hearing, speech, seizures, and nutrition, improve the overall prognosis in cases of Cerebral palsy.

Keywords: Post-meaning encephalitis, cerebral palsy, prematurity, Perinatal asphyxia.

DOI: 10.21303/2504-5679.2023.002887

1. Introduction

Because of the wide variety of causes of CP, the exact numbers from different studies do not completely agree. However, there is a remarkable similarity in the prevalence across the world, from Sweden in the 1980s with a prevalence of 2.4 per 1000 and 2.5 per 1000 in the early 1990s, 2.3 per 1000 from Atlanta and 1.6 per 1000 in China. Considering the difficulty in making specific

diagnoses, and especially finding mild cases, these numbers probably reflect much more variation in counting than clear differences in prevalence. A report from England, which is representative of many studies, shows that there has not been much change in prevalence over the past 40 years. Since CP is a continuing problem, it is important to study and explore the causes and newer aspects of the condition for proper understanding and management [1–3].

In high-income countries, CP registers have made substantial contributions to our understanding of CP [4, 5]. However, there remains a relative paucity of corresponding information about cerebral palsy in low and middle-income countries, and in these countries, there are gaps in knowledge, especially in spheres of epidemiological research, intervention, and appropriate services.

Since CP is a continuing problem, it is important to study and explore the causes and newer aspects of the condition for proper understanding and management. In high-income countries, CP registers have made substantial contributions to our understanding of CP. However, in low- and middle-income countries, there are gaps in knowledge, especially in spheres of epidemiological research, intervention, and service utilisation [6]. To date, there is no exact database of CP patients in India. Furthermore, there is a lack of large-scale community studies estimating the exact prevalence of CP in India. Limited data are available regarding the CP patients in Jammu region. Raina et al., in their study of 3966 children aged > 10 years from RS Pura, a town on the outskirts of Jammu, reported a prevalence rate of CP as 2.27 % [7]. It has been observed that children with CP often report to the outpatient or the inpatient section of the paediatrics department due to various medical problems and concerns about developmental delay. Therefore we planned to report the clinical spectrum, etiological factors and associated comorbidities with cerebral palsy children.

The aim: The present study is a descriptive study done on clinical profile, etiology, and comorbidities.

2. Materials and methods

The present study is a hospital-based descriptive study of children presenting to Niloufer Hospital for Child Health, Hyderabad, Telangana, with clinical features suggestive of cerebral palsy. 80 cases of Cerebral palsy were studied over 18 months from June 2020, to January 2021.

A total of 80 cases were included in the study chosen as per inclusion criteria guided by «The Definition and classification of cerebral palsy, April 2006 International consensus». The cases chosen above were evaluated by clinical history and clinical examination and necessary investigations using a systematically designed proforma. Thorough clinical history was collected regarding presenting complaints, birth history, and developmental history in each case. A thorough clinical examination was done, especially the neurological examination and Ophthalmic and Oto-rhinolaryngology examination. Relevant investigations like CT-brain or MRI- brain, Brainstem Auditory Evoked Response were done in cases which warranted the same.

Inclusion criteria: Cases of developmental delay with neurological examination consistent with cerebral palsy and Non-progressive brain malfunction, manifested early in life, Motor impairment definitive like monoplegia, diplegia, quadriplegia (impairment must stem from the malfunction of the brain, rather than the spinal cord or muscles).

Exclusion criteria: Motor impairment due to malfunction of the spinal cord or muscles and Progressive neurological disorder.

CP was categorised according to neurological subtype and severity. Subtype stratification was based on the topographic pattern of the affected limbs, and the predominant quality of motor impairment in those limbs.

These subtypes were spastic quadriplegia, spastic hemiplegia, spastic diplegia (spasticity in the lower extremities far in excess of any observable spasticity in the upper extremities), dyskinetic (dystonic or athetoid) and ataxic. The GMFCS was used to describe functional motor severity, using scores ranging from most able (Level I) to least able (Level V). The last available CP subtype and GMFCS level data were used in this study.

Informed consent was taken from the parent or guardian of the child. Ethical clearance was taken from the institutional ethical committee (Osmania Medical College, date 8/5/2019, Reg No-19101001030D).

Clinical Assessment included: history, sociodemographic profile, risk factors, clinical subtypes (topographic types), the severity of motor outcome scored by GMFCS (gross motor function classification system) scale for CP, impairment on vision or on hearing were undertaken and recorded in a predesigned proforma. Ophthalmic examination in the form of visual acuity, refraction, and fundoscopy was performed in all participants. A screening test for hearing assessment was performed by Brainstem evoked response audiometry (BERA). Cognition was evaluated by calculating the social quotient using the Vineland Social Maturity Scale for children younger than 6 years and the intelligence quotient using Binet Kamat Scale for children older than 6 years. 36,37 DQ (developmental quotient) was assessed using Denver developmental scale II and neuroimaging was advised in all cases. The data is described in terms of frequencies and percentages of categorical variables.

3. Results

Among 80 cases, 61 % were spastic quadri-paresis, 14.8 % spastic-diplegia, 11.8 % spastic-hemiparesis 2.3 % were spastic monoparesis, 6.5 % hypotonic CP, 2.5 % were mixed and 1 % dystonic CP (**Table 1**).

Table 1

Distribution on types of Cerebral Palsy

Type	Number of cases	Cumulative percent
Spastic monoparesis	2	2.5
Spastic diplegia	10	12.5
Spastic quadriparesis	49	61.25
Spastic hemiparesis	10	12.5
Hypotonic CP	6	7.5
Dystonic CP	1	1.25
Mixed CP	2	2.5
Total	80	100.0

In our study, 7.5 % of children were age less than 1 year; 25 % of children – 1–2 years; 26.3 % of children – 2–3 years, 26.3 % of children – 3–4 years of age and 15 % of children – 4–5 years of age. Among both genders, the majority of cases were of spastic quadriparesis (**Table 2**).

Table 2

Age of children with cerebral palsy

Age	Number of cases	Cumulative percent
Less than 1 year	6	7.5
1–2 year	20	25.0
2–3 year	21	26.3
3–4 years	21	26.3
4–5 years	12	15.0
Total	80	100.0
Gender		
Male	54	67.5
Female	26	32.5

4. Discussion

Cerebral palsy is the most common motor disability in children. This study was conducted aimed at clinical patterns, etiological factors and comorbidities in children admitted to Niloufer Hospital.

A similar study was previously conducted by Vykuntaraju K Gowda et al. Indra Gandhi Institute of child health in Bangalore, Karnataka. This study enrolled 100 children of age with clinical features suggestive of cerebral palsy (**Table 3**).

Table 3
Comparison of our study with Vykuntaraju k Gowda et al. study

Place of study	Our observations (%) in 2021	Gowda VK et al in 2015 [4]
	Indhra Gandhi Institute of child health, Bangalore	Niloufer Hospital
1	2	3
Spastic	88.7	81
Monoparesis	2.5	1
Triplegia	0	0
Quadriparesis	61.25	58
Hemiparesis	12.5	9
Hypotonic	7.5	
Dystonic	1.25	5
Mixed	2.5	2
Male	55	67.5
Female	45	32.5
Birth order		
1st order	65	65
2nd order	23	25
3rd order	7	8.8
4th and more	1	1.3
Socio-economic		
Upper middle	11	13.8
Lower middle	53	37.5
Lower middle	36	48.8
Region		
urban	50	45
rural	50	55
Age		
< 18 years	2	1.3
19–25	72	75
26–30	17	18.8
31–35	5	5
Consanguinity		
Non-consanguineous	64	66.3
Second degree	32	28.7
Third degree	4	5
Gestational age		
Term	81	87.5
Late preterm	4	1.25
Moderate preterm	14	8.75
Extreme preterm	1	1.25
Birth weight		
2.5–4	66	71.2
2–2.5	15	15
1.5–2	11	11.25
< 1	1	2.5
Mode of delivery		
Vaginal	81	82.5
Instrumental	3	5
LSCS	12	12.5

Continuation of Table 3

1	2	3
Prenatal Factors		
Infections	1.25	4
Twins	2.5	0
Malformations	1.25	16
Natal Factors Birth Asphyxia	**45**	**43**
Prematurity	12.5	15
Instrumentation	5	3
Precipitate labour	0	3
Postnatal Factors		
Neonatal hyperbilirubinemia	7.5	3
meningitis	6.25	8
intracranial bleed	6.25	6
Impairment		
Intellectual disability	90	55
Speech	50	38
Visual	24	26
Hearing	13	11
Seizure disorder	87	46
Feeding problems	77	19
Undernutrition	56	47

Spastic cerebral palsy is the most common type of Cerebral palsy in our study, of which spastic quadriplegia was the most common. A high proportion of spastic diplegia (40 %) is seen in preterm similar to the high number of spastic diplegia seen in developed countries where premature care is more. Singhi et al., in 2002, in a study from North India, reported quadriplegic spastic CP in 61 % and diplegic CP in 20 % of the total CP children [7]. In another study in 2013, Singhi et al. reported 51.5 % spastic quadriplegia and 34.5 % diplegia [8]. Das et al. reported 43 % spastic quadriplegia and 12 % spastic diplegia, and Gowda et al. reported 71 % spastic quadriplegia and 16 % spastic diplegia [9–11]. Hence, our results are consistent with all these Indian studies.

A male preponderance was observed in our study with male to female ratio of 2:1 similar to other studies. Male sex preponderance has been reported in a number of studies by Tatavarti et al., [12] Johnson [13] in Europe, Laisram et al., [14] and Das et al. [10] in India.

Most of them belong to the rural population (55 %), suggesting a lack of antenatal care and counselling and proper health care facilities and delayed referral of high-risk mothers to higher centres, and 45 % were urban residents. In our study, 48.8 % belonged to the lower middle, followed by 37.4 % upper lower and 13.8 % to the upper middle according to the modified kuppuswamy classification. Birth order of the affected children our study showed 65 % were first born and 23 % were second born. Incidence of CP was less in higher order birth because of improved knowledge attitude and practice of parents in seeking obstetric and perinatal care. 91.3 % of cases were institutional deliveries, and 8.8 % of cases were home delivery. Of institutional deliveries, 65.7 % of cases were from PHCs, and 34.3 % of cases were delivered in a secondary or tertiary hospital. A lack of timely intervention or referral at primary centres was observed. At referral centres, more high-risk cases have been delivered, and very sick newborns have been managed, resulting in neurological morbidity and cerebral palsy. The gestational age of the affected children observed in our study was term gestation in 80 %, late preterm (34–36 weeks) in 1.25 % and preterm (< 34 weeks) in 10 %. 4 out of 10 preterms (32 %) had spastic diplegia. Periventricular leukomalacia the important pathology observed in spastic diplegia is most commonly observed in prematurity. Birth weight of the affected children: 66 % of the children weighed between 2.5 to 4 Kg, and 2.5 % of them weighed < 1 Kg. Low birth weight was observed in 29 % of our cases, but prematurity was seen in 19 % indicating a 16.5 % of term children were IUGR in our study. CP in children's normal birth weight was mainly

caused by global ischemia secondary to perinatal asphyxia, cerebral malformation, intracranial bleeding and post-natal infections (Pyomeningitis). This was comparable with other studies [8, 15].

Consanguinity observed in our study was 32 % with a similar history of cerebral palsy in a family of 3 %. History of sibling death was seen in 7.5 % of cases. Risk factors in our study were classified into antenatal, natal and post natal based on the time of injury to the brain. Of 80 cases of cerebral palsy majority of the cases were due to natal factors, 64.7 % followed by post-natal 20 %. Antenatal risk factors 5 % contribute to less number similar to all other studies [16, 17].

Antenatal risk factors evaluated in our study are maternal pregnancy-related complications like antepartum haemorrhage, pregnancy-induced hypertension, maternal infections malformations, results of which 18 % had pregnancy-related complications, 1.25 % had TORCH, and 1 case (1.25 %) had a malformation in the form of lissencephaly. Antenatal risk factors were predominantly known to cause vascular insult and, thereby, hypoxia resulting in spastic CP. PIH was the most common antenatal factor resulting in spastic CP.

Among natal factors, perinatal asphyxia is the leading cause, with 45 % indicating better obstetric care and delivery room care. Of which 66.6 % required positive pressure ventilation and oxygen requirement suggesting an early insult and hidden hypoxia in these cases. 22.2 % required mechanical ventilation, and 11.1 % of cases needed only tactile stimulation. The second most common cause is preterm, with 12.5 % secondary to increased survival of morbid preterm. 3 % of cases were meconium stained, and 3 % of cases were born with cord around the neck. Post-natal risk factors, including neonatal sepsis observed in 7.5 % of cases. Incidence of intracranial bleeding during infancy was observed in 7.5 % of cases. CP secondary to Bilirubin encephalopathy was observed in 5 % of cases. All these are preventable with early identification and proper treatment.

Comorbidities associated with cerebral palsy in our study are intellectual disability which is seen in almost 90 % of cases, of which 60.1 % profound mental retardation(IQ < 20), 22.2 % severe (IQ 20-40), 13.3 % moderate (IQ 35-55), 4.4 % mild (IQ 50-70). Was observed in 55 % of cases the second most common morbidity is a seizure disorder, observed in 87.5 % of Speech Abnormalities were observed in 60 % of cases (both receptive and expressive). Visual Problems were observed in 24.8 % of which strabismus – 40.65, nystagmus – 37.5 %, refractive errors – 15.6 % cortical blindness was seen in 6.25 % of cases). Hearing impairment in 13.7 % of our cases (sensorineural hearing loss). Abnormal behaviour is seen in 2.5 % of cases; 77.5 % of the children had feeding problems, of which 72.9 % are fed by assistance 6.3 % are on tube feeding. Skeletal abnormalities were seen in 43.75 %; the most common skeletal abnormality seen is B/L knee contractures, followed by elbow contractures, equino valgus deformity and kyphoscoliosis. Malnutrition is observed in more than half of the cases) of which 40 % of cases belonged to severe malnutrition and 60 % cases belonged to moderate malnutrition. 50 % of cases had signs of vitamin D deficiency like frontal bossing, pectus excavatum, and rachitic rosary. Scurvy is seen in 2 cases (2.5 %). Dass et al. had also reported speech defects (76 %), visual defects (23 %), and hearing problems (18 %). Singhi et al. reported speech problems (83.7 %), visual defects (46.7 %), and hearing problems (13.9 %). Our results are consistent with these authors [10, 9]. Sasmal et al., in a study of 140 patients of CP observed an overall incidence of ocular abnormalities of 42.1 %. These were strabismus (36.4 %), myopia (12.9 %), hypermetropia (8.6 %), astigmatism (3.6 %), optic atrophy (2.1 %), and nystagmus (2.1 %). Cortical visual impairment was seen in 20.7 % [18].

In a recent pilot study, on the infectious causes of childhood disabilities from rural subdistrict of Bangladesh, 57 % of CP children had never received any rehabilitative support or services. Only 21.1 % were attending regular school, and just 0.2 % attended a special school [19].

Various studies have reported other comorbidities like learning disability, Attention Deficit Hyperactive Disorder (ADHD), Autism Spectrum Disorder (ASD), bowel, and bladder problems, behavioural, emotional, sexual problems, pain and sleep problems in CP [20–23]. The differences observed in the distribution of different comorbidities may be due to various factors: lack of use of specific assessment tools, differences in risk factors, CP types, facilities and health-seeking behaviour.

Study limitations: Some limitations of present studies are short duration, relatively less number of patients, for mental/cognitive assessment IQ was not done. So, for a definitive conclusive remark, more patients are required for epidemiological research in the present area, which authors

will be coming up with in future. However, further studies with more specific aims are required to improve the quality of life of these children.

Prospects for further research: study results require further large-scale community-based studies with long-term follow-ups. The predominance of intrapartum and post-natal antecedents in our setting definitely points towards the urgent need for some policy-level changes in global health management and more effective strategies in the delivery of maternal and child health services in low-resource settings.

5. Conclusion

Spastic quadriparesis was the most common clinical form of cerebral palsy observed in our study, mostly secondary to global ischemia during the perinatal period, which is mostly preventable. Timely obstetrical intervention and immediate newborn care can still play a major role in preventing cerebral palsy; hence, there is an urgent need to further strengthen the existing maternal and child health services.

Comorbidities are significantly observed in cases of cerebral palsy. Appropriate screening and management of comorbidities, especially vision, hearing, speech, seizures and nutrition improve the overall prognosis in cases of Cerebral palsy. Seizures add the dimension of uncertainty to the otherwise relatively static problem of cerebral palsy. The presence of seizures is associated with an increased risk of cognitive problems and a greater burden of care.

Conflict of interest

The authors declare that there is no conflict of interest in relation to this paper, as well as the published research results, including the financial aspects of conducting the research, obtaining and using its results, as well as any non-financial personal relationships.

Funding

The study was performed without financial support.

Data availability

Data will be made available on reasonable request.

References

[1] Essex, C. (2003). Hyperbaric oxygen and cerebral palsy: no proven benefit and potentially harmful. Developmental Medicine & Child Neurology, 45 (3). doi: https://doi.org/10.1017/s0012162203000409

[2] Tilton, A. H. (2003). Injectable Neuromuscular Blockade in the Treatment of Spasticity and Movement Disorders. Journal of Child Neurology, 18 (1), S50–S66. doi: https://doi.org/10.1177/08830738030180010s0701

[3] Goldstein, E. M. (2001). Spasticity Management: An Overview. Journal of Child Neurology, 16 (1), 16–23. doi: https://doi.org/10.1177/088307380101600104

[4] Gowda, V., Kumar, A., Shivappa, S., Srikanteswara, P., Mahadeviah, M., Ramaswamy, P. et al. (2015). Clinical profile, predisposing factors, and associated co-morbidities of children with cerebral palsy in South India. Journal of Pediatric Neurosciences, 10 (2), 108–113. doi: https://doi.org/10.4103/1817-1745.159191

[5] Khandaker, G., Smithers-Sheedy, H., Islam, J., Alam, M., Jung, J., Novak, I. et al. (2015). Bangladesh Cerebral Palsy Register (BCPR): a pilot study to develop a national cerebral palsy (CP) register with surveillance of children for CP. BMC Neurology, 15 (1). doi: https://doi.org/10.1186/s12883-015-0427-9

[6] Raina, S. K., Razdan, S., Nanda, R. (2010). Prevalence of Cerebral Palsy in Children <10 Years of Age in R.S. Pura Town of Jammu and Kashmir. Journal of Tropical Pediatrics, 57 (4), 293–295. doi: https://doi.org/10.1093/tropej/fmq095

[7] Singhi, P. D., Ray, M., Suri, G. (2002). Clinical Spectrum of Cerebral Palsy in North India – An Analysis of 1000 Cases. Journal of Tropical Pediatrics, 48 (3), 162–166. doi: https://doi.org/10.1093/tropej/48.3.162

[8] Singhi, P., Saini, A. G. (2013). Changes in the Clinical Spectrum of Cerebral Palsy over Two Decades in North India--An Analysis of 1212 Cases. Journal of Tropical Pediatrics, 59 (6), 434–440. doi: https://doi.org/10.1093/tropej/fmt035

[9] Hagberg, B., Hagberg, G., Olow, I. (1993). The changing panorama of cerebral palsy in Sweden. VI. Prevalence and origin during the birth year period 1983–1986. Acta Paediatrica, 82 (4), 387–393. doi: https://doi.org/10.1111/j.1651-2227.1993.tb12704.x

[10] Das, N., Bezboruah, G., Das, I. (2016). Study on the Clinical Profile of Patients with Cerebral Palsy. IOSR Journal of Dental and Medical Sciences, 15 (7), 54–58. doi: https://doi.org/10.9790/0853-150755458

[11] Odding, E., Roebroeck, M. E., Stam, H. J. (2006). The epidemiology of cerebral palsy: Incidence, impairments and risk factors. Disability and Rehabilitation, 28 (4), 183–191. doi: https://doi.org/10.1080/09638280500158422

[12] Tatavarti, S. R., Garimella, R. R., Subbalakshmi, T. D. (2018). Male sex preponderance in cerebral palsy. International Journal of Orthopaedics Sciences, 4 (3.2), 200–202. doi: https://doi.org/10.22271/ortho.2018.v4.i3d.37

[13] Johnson, A. (2002). Prevalence and characteristics of children with cerebral palsy in Europe. Developmental Medicine & Child Neurology, 44 (9), 633–640. doi: https://doi.org/10.1017/s0012162201002675

[14] Laisram, N., Srivastava, V. K., Srivastava, R. K. (1992). Cerebral palsy – An etiological study. The Indian Journal of Pediatrics, 59(6), 723–728. doi: https://doi.org/10.1007/bf02859408

[15] Bhati, P., Sharma, S., Jain, R., Rath, B., Beri, S., Gupta, V., Aneja, S. (2019). Cerebral palsy in North Indian children: Clinico-etiological profile and co-morbidities. Journal of Pediatric Neurosciences, 14 (1), 30. doi: https://doi.org/10.4103/jpn.jpn_46_18

[16] Belonwu, R., Gwazo, G., Adeleke, S. (2009). Cerebral palsy in Kano, Nigerian – A review. Nigerian Journal of Medicine, 18 (2), 186–189. doi: https://doi.org/10.4314/njm.v18i2.45062

[17] Bax, M., Tydeman, C., Flodmark, O. (2006). Clinical and MRI Correlates of Cerebral Palsy. JAMA, 296 (13), 1602–1608. doi: https://doi.org/10.1001/jama.296.13.1602

[18] Dixon, J., Harrison, A., New, B. (1997). Series: Funding the NHS. Is the NHS underfunded? BMJ, 314 (7073), 58–58. doi: https://doi.org/10.1136/bmj.314.7073.58

[19] Sasmal, N. K., Maiti, P., Mandal, R., Das, D., Sarkar, S., Sarkar, P., et al. (2011). Ocular manifestations in children with cerebral palsy. Journal of Indian Medical Association, 109, 318–323.

[20] Khandaker, G., Muhit, M., Rashid, H., Khan, A., Islam, J., Jones, C., Booy, R. (2014). Infectious Causes of Childhood Disability: Results from a Pilot Study in Rural Bangladesh. Journal of Tropical Pediatrics, 60 (5), 363–369. doi: https://doi.org/10.1093/tropej/fmu031

[21] Baxter, P. (2013). Comorbidities of cerebral palsy need more emphasis – especially pain. Developmental Medicine & Child Neurology, 55 (5), 396. doi: https://doi.org/10.1111/dmcn.12137

[22] Ayanniyi, O., Abdulsalam, K. (2016). Profile of children with cerebral palsy attending outpatient physiotherapy clinics in southwest Nigeria. African Journal of Physiotherapy and Rehabilitation Sciences, 7 (1-2), 32–39. doi: https://doi.org/10.4314/ajprs.v7i1-2.6

[23] Kakooza-Mwesige, A., Forssberg, H., Eliasson, A.-C., Tumwine, J. K. (2015). Cerebral palsy in children in Kampala, Uganda: clinical subtypes, motor function and co-morbidities. BMC Research Notes, 8 (1). doi: https://doi.org/10.1186/s13104-015-1125-9

Received date 07.02.2023
Accepted date 16.03.2023
Published date 31.03.2023

How to cite: *Ravula, C. J., Kankala, S., Alladi, A., Thotada, P. L., Kalivela, S. (2023). A study of clinico etiological profile of children with cerebral palsy in a tertiary care centre. EUREKA: Health Sciences, 2, 16–23. doi: http://doi.org/10.21303/2504-5679.2023.002887*