Original Research

ANTENATAL, PERINATAL AND POSTNATAL RISK FACTORS IN CHILDREN WITH CEREBRAL PALSY: A HOSPITAL-BASED OBSERVATIONAL STUDY

Dr. Nidhi Khullar[1], Dr. Vasundhara Bakshi[2*], Dr. Harpreet Singh[3], Dr. Nanni Salathia[4], Dr. Parmeet Kaur[5]

[1,4]Senior Resident, Department of Paediatrics, Government Medical College Jammu.
[2*]Attending Consultant, Neonatal Paediatric and Adolescent Medicine, BLK-Max Superspeciality Hospital.
[3]Fellow NNF, Ankur Multispeciality Hospital Jalandhar, Punjab.
[5]Senior Resident, HIMSR and HAHC Hospital, New Delhi.
Email: dr.vasundharabakshi@gmail.com
Corresponding Author: Dr Vasundhara Bakshi
Attending Consultant, Neonatal Paediatric and Adolescent Medicine, BLK-Max Superspeciality Hospital.

ABSTRACT

Background: Cerebral Palsy (CP) is a complex neurodevelopmental disorder affecting children across the globe. This study aimed to identify the prevalent antenatal, perinatal, and postnatal factors associated with CP. **Methods**: The present study was conducted at the Department of Pediatrics, Govt. Medical College Jammu over a period of one year with effect from September 2022 to August 2023. A total of 45 patients with cerebral palsy were enrolled, and data on demographic profile, antenatal, perinatal, and postnatal history were collected and analyzed. **Results:** We observed that mean age of study patients was 6.3 years, with majority being male accounting for (57.8%). Evidently, antenatal factors such as; maternal age (25-29 years), maternal illness (86.7%), infections during pregnancy (28.9%), and antibiotic use (17.8%) were prevalent. The assessment of perinatal factors revealed that gestational age (≥ 37 weeks, 73.3%), birth weight (2.5-3.5 kg, 73.3%) and normal vaginal delivery (73.3%) were commonest among the studied population. Among the postnatal factors; neonatal sepsis (73.3%), neonatal seizures (46.7%), NICU admission (77.8%), meningitis (42.2%), mechanical ventilation (44.4%), and hypoxic-ischemic encephalopathy (HIE) (46.7%) were prevalent. **Conclusion:** Our study demonstrated the prevalence of various antenatal, perinatal and postnatal factors contributing to CP, which essentially emphasizes the need for careful maternal and child healthcare policies to improve outcomes

Keywords: Cerebral Palsy, Maternal Healthcare, Child Healthcare, Antenatal Factors, Perinatal Factors, Postnatal Factors, Neonatal Sepsis, NICU Admission.

INTRODUCTION

Cerebral palsy (CP) is the most prevalent physical disability in childhood, affecting approximately 17 million children globally (Cerebral Palsy Facts & Statistics 2024).[1]Characterized by impaired movement, posture, and muscle tone, CP is a neurological disorder resulting from brain damage or abnormalities during fetal development or early childhood. Despite advances in medical care, CP remains a significant cause of physical disability in children worldwide. The prevalence of CP in developed countries has remained relatively stable since the 1950s, with shifts in subtype distribution and severity levels.[2]

www.ajmrhs.com
eISSN: 2583-7761

Date of Received: 29-01-2026
Date Acceptance: 12-02-2026
Date of Publication: 13-03-2026

Improved survival rates of preterm babies initially contributed to increased CP cases, but recent trends indicate a decline in prevalence across certain gestational age groups.[2] Up to 50% of CP cases have no known underlying etiology.[3-5] According to when the insult occurred, the etiologies can be categorized as prenatal (the most frequent), natal, or postnatal. A different etiologic classification scheme is dependent on the actual cause, such as congenital (developmental, malformations, syndromic), or acquired (traumatic, infectious, hypoxic, ischemic, TORCH infections, and others). Only 8% to 15% of cases are caused by perinatal asphyxia.[6] The understanding of birth asphyxia as a primary cause of CP has evolved.[2] Previously implicated as a leading cause, birth asphyxia's definition has been inconsistent, often relying on non-specific clinical signs. Research suggests that the association between birth asphyxia and CP may be overstated, highlighting the multifactorial etiology of CP.[7] Contributing factors include antenatal, perinatal, and postnatal elements, which may be causal, predictive,

or indicative of compromised fetal or neonatal well-being.[8-10] This hospital-based observational study aims to identify risk factors associated with CP, shedding light on potential areas for intervention and improving outcomes.

METHODS

This hospital-based observational study was primarily conducted to identify antenatal, perinatal, and postnatal risk factors associated with Cerebral Palsy (CP) in children. The study was conducted at the Department of Pediatrics, Govt. Medical College Jammu over a period of one year with effect from September 2022 to August 2023. The study population encompassed children diagnosed with CP, aged 0-18 years, who are attending the pediatric neurology clinic or admitted to the hospital. However, children with progressive neurological disorders or neurodegenerative diseases, and those with CP due to postnatal head trauma or infections (e.g., meningitis, encephalitis) were excluded. A minimum of 45 cases of CP and were be enrolled in the study. Data was collected using a pre-designed, semi-structured questionnaire, which included demographic information, antenatal history, perinatal history, postnatal history, and clinical features of CP. Finally, data was analyzed using SPSS software (version 25.0). Descriptive statistics was used to summarize the data. The study was approved by the Institutional Ethics Committee, and informed consent was obtained from parents/guardians of all participants.

RESULTS

Table 1: Age and Gender Distribution of Study Patients

Age (Years)	**Number**	**Percentage**
2-5 Years	21	46.7
5-10 Years	15	33.3
≥ 10 Years	9	20
Total	45	100
Mean±SD (Range)=6.3±4.43 (2-17 Years)		
Gender	No	**Percentage**
Male	26	57.8
Female	19	42.2
Total	45	100

We observed that the majority of the patients (46.7%) were in the 2-5 years age group, followed by 5-10 years (33.3%), and ≥ 10 years (20.0%). The mean age of the patients was 6.3±4.43 years, ranging from 2-17 years. Males (57.8%) outnumbered females (42.2%) as reflected in table 1.

Table 2: Antenatal Risk Factors Among Study Patients

Antenatal risk factor		**Number**	**Percentage**
Maternal age	< 25 Years	8	17.8
	25-29 Years	25	55.6
	≥ 30 Years	12	26.7
Parity	Para 1	19	42.2
	Para 2	15	33.3
	Para 3	11	24.4
Maternal illness	Present	6	13.3
	Absent	39	86.7
Infection during pregnancy	Present	13	28.9
	Absent	32	71.1
Antibiotics during pregnancy	Present	8	17.8
	Absent	37	82.2
Multiple pregnancy	Present	2	4.4
	Absent	43	95.6

We observe that for majority of the patients (55.6%), the maternal age was between 25-29 years, followed by 26.7% patients with maternal age of ≥ 30 years, and 17.8% patients with maternal age of <25 years. Majority of our patients (42.2%) had para 1 status, followed by 33.3% patients with para 2, and 24.4% patients with parity 3. Maternal illness was present in 13.3%of patients, infection during pregnancy was present in 28.9% patients and 17.8% were taking antibiotics. Multiple pregnancies were seen in 4.4% patients (see table 2).

Table 3: Perinatal Risk Factors Among Study Patients

Perinatal risk factors		Number	Percentage
Gestational age	< 34 Weeks	3	6.7
	34-37 Weeks	7	15.6
	≥ 37 Weeks	35	77.8
Birth Weight (Kg)	< 2.5	10	22.2
	2.5-3.5	33	73.3
	≥ 3.5	2	4.4
Place of delivery	Home	11	24.4
	Institutional	34	75.6
Mode of delivery	LSCS	12	26.7
	NVD	33	73.3
Meconium-stained amniotic fluid	Yes	6	13.3
	No	39	86.7
Antibiotics during labour	Yes	28	62.2
	No	17	37.8
Assisted techniques	Yes	7	15.6
	No	38	84.4

When the prenatal risk factors were assessed, we observed that gestational age for majority of patients (73.3%) was ≥ 37 weeks, followed by 15.6% with gestational age 34-37 weeks and 6.7% patients with gestational age < 34 weeks. Majority of our patients (75.6%) had institutional delivery and most of the patients (73.3%) had NVD mode of delivery. The meconium-stained amniotic fluid was present in 13.3% patients and absent in 86.7% patients. Around 62.2% patients were taking antibiotics during labour and the assisted techniques were evident in 15.5% patients as opposed to 84.4% patients without assisted techniques as shown in table 3.

Table 4: Postnatal Risk Factors of Study Patients

Postnatal Risk Factor		Number	Percentage
Neonatal sepsis	Yes	33	73.3
	No	12	26.7
Meningitis	Yes	19	42.2
	No	26	57.8
Hypoglycemia	Yes	3	6.7
	No	42	93.3
Neonatal seizures	Yes	21	46.7
	No	24	53.3
HIE Grade	Grade I	4	19
[n=21]	Grade II	12	57.1
	Grade III	5	23.8
Neonatal Jaundice	Yes	14	31.1
	No	31	68.9
Bilirubin encephalopathy	Yes	5	11.1
	No	40	88.9
Mechanical ventilation	Yes	20	44.4
	No	25	55.6
Congenital malformations	Yes	5	11.1
	No	40	88.9
NICU admission	Yes	35	77.8
	No	10	22.2
Duration of NICU Stay [n=35]	< 15 Days	5	14.3
	15-30 Days	16	45.7
	≥ 30 Days	14	40

When the postnatal risk factors were assessed among the studied subjects, we found that neonatal sepsis was present in 73.3% patients, meningitis was present in 42.2% patients, hypoglycemia was evident in 6.7% patients, neonatal seizures were present in 46.7% patients and HIE was present in 21 patients, out of which majority (57.1%) had grade II HIE, 23.8% had grade III HIE and 19% had grade I

HIE. Furthermore, neonatal jaundice was present in 31.1%, while only 11.1% presented with bilirubin encephalopathy. Mechanical ventilation was required in 44.4% patients while congenital malformation was evident in 11.1% patients. Out of total 45 subjects, history of NICU admission was present in 77.8% patients, with median stay of 25 days. Majority (45.7%) had a stay of 15-30 days, followed by 40% with >=30 days while only 5 patients (14.3%) had a stay of <15 days (see table 4).

DISCUSSION

In the present study, the patients' ages ranged from 2 to 17 years, with a mean age of 6.3±4.43 years. The majority (46.7%) were between 2-5 years old, followed by 33.3% between 5-10 years, and 20% were 10 years or older. This age distribution is consistent with study of Ramanandi et al, who reported the average age of their patients as 5.32±3.13 years, with majority of them belonging to the age group of 2-8 years, which is comparable with our study.[11] Likewise, Turkoglu et al, documented the mean age of their patient population was 8.10 years with range being 2-16, which is compatible with our results.[12] The predominance of young children in our study (2-5 years) is likely to influence parental experiences, as reported in other studies (Banskota et al., Thapa et al., Singhi et al.).[13-15] Evidently, we observed a male predominance over females (57.8% vs. 42.2%), which is consistent with existing literature. For instance, Banskota et al. reported 60% males, Chaudhray et al. reported 74.54% males, and Ramanandi et al. reported 67.57% males.[11,13,16] This male bias has been attributed to the biological vulnerability of males to developing CP (Chaudhray et al.).[16]

Our analysis of antenatal risk factors revealed that the majority of mothers (55.6%) were between 25-29 years old, followed by 26.7% who were 30 years or older, and 17.8% who were under 25 years. This age distribution is consistent with previous studies, including those by Ramanandi et al., Wang et al.,and Ribeiro et al.,.[11,17,18] For instance; Ramanandi et al. also reported a similar trend, with 71.73% of mothers aged 28-37 years, suggesting that maternal age may influence parenting experiences.[11] Regarding parity, 42.2% of our patients were para 1, 33.3% were para 2, and 24.4% had a parity of 3 or more. A significant proportion (86.7%) of mothers had a history of illness, with 28.9% experiencing infections during pregnancy and 17.8% taking antibiotics. Multiple pregnancies were reported in 4.4% of cases. These findings are comparable to those of Bax et al., who reported maternal infection in 39.5% of cases and antibiotic use in 15.5% of pregnancies.[19] However, their study reported a higher rate of multiple pregnancies (12%), although our rate is consistent with the general population rate (Dex et al.).[20]

When the perinatal risk factors were assessed, we observe that gestational age for majority of patients (73.3%) was ≥ 37 weeks, followed by 15.6% with gestational age between 34-37 weeks and 6.7% patients with gestational age < 34 weeks. In our study, around 73.3% patients had their birth weight between 2.5-3.5 kg, 22.2% had a birth weight below 2 kg, and 4.4% had above 3.5 kg birth weight. In a study by Abdullahi et al, gestational age and birth weight were not associated with CP, which is compatible with our observation.[21] In fact, numerous studies like those done by Hagberget al and Grether et al have reported that more than half of children with CP are not preterm deliveries, which is consistent with our study.[22,23] However, in a study by Wu et al , prematurity and low birth weight have been reported to be associated with CP in other populations, which in consonance with our study in which 22.2% CP patients had low birth.[24] In a study by Agarwal et al, out of 98 children diagnosed with cerebral palsy only 22.2% of children had premature status, which is similar to our observation.[25] In a study by Sharma et al, majority of patients had birth weight between 2000-2500 grams (58.33%),while 17(28.33%) had birth weight >2500 grams and 8 (13.33%) had birth weight <2000 grams which is consistent with our observation.[26] Majority of our patients (75.6%) had institutional delivery and most of the patients (73.3%) had NVD mode of delivery as opposed to 26.7% with LSCS. In a study by Bax et al, it was reported that 32.3% of births required an emergency caesarean delivery, whereas 44.8% of the babies were delivered naturally vaginally.[19] While remaining patients were divided into 7% scheduled caesarean deliveries, 4.2% ventouse extractions, 6.1% forceps deliveries, and 2.3% breech deliveries. Meconium-stained amniotic fluid was observed in 13.3% of our patients, while 86.7% had clear amniotic fluid. Around 62.2% patient's mothers were taking antibiotics during labour and the assisted techniques were evident in 15.5% patients as opposed to 84.4% patients without assisted techniques. Interestingly, Meeraus et al., found no significant association between prenatal antibiotic use and cerebral palsy or epilepsy in childhood.[27] However, they did note an increased risk when macrolides were prescribed instead of penicillin, although the absolute risk remained low. This highlights the importance of judicious antibiotic use during pregnancy. Treating maternal infections is a potential prevention strategy, as emphasized by Nelson et al.[28] A systematic approach to identifying and managing infections during pregnancy could be beneficial. This approach could help mitigate risks associated with infections and potentially reduce the incidence of cerebral palsy.

The assessment of postnatal risk factors among the studied subjects revealed that neonatal sepsis was present in 73.3% of patients, meningitis in 42.2%,

hypoglycemia in 6.7%, neonatal seizures in 46.7%, and hypoxic ischemic encephalopathy (HIE) in 46.7% of patients. Among those with HIE, 19% had grade I, 57.1% had grade II, and 23.8% had grade III HIE. These findings are consistent with previous studies, which have identified neonatal sepsis and birth asphyxia as major postnatal causes of cerebral palsy (Kulkarni et al., Singhi et al., Venkatesh G et al.).[15,29,30] Specifically, in a study by Kulkarni et al, birth asphyxia (37.8 %) was most common postnatal cause of CP. Other causes were meningitis (14.9 %), hypoglycemia (9.5 %), hypocalcemia (6.8 %), kernicterus (6.8 %), ICH (5.4 %), stroke (4.1 %) and idiopathic (9.5 %), which is cnsistent.[29] In another study by Venkatesh G et al, incidence of seizures in late preterm and term neonates was 0.76%. Hypoxic ischemic encephalopathy (HIE) was the commonest etiology (50.4%) followed by sepsis (24.8%). Majority of HIE neonates presented within 12 hrs of life (89%).[29] Hypoglycemia (21.2%) was the commonest primary metabolic abnormality followed by hypocalcemia (9.7%). In a study by Singhi et al, the commonest causes of CP in Indian scenario were reported as low birth weight, and neonatal sepsis which contributed to 56.4% of the 1000 cerebral palsy children from rehabilitation centre for disabled children, which is comparable with our study.[15] Blair et al. reported that in developing nations like India, the primary causes of cerebral palsy are birth asphyxia, neonatal sepsis, neonatal jaundice, and low birth weight, whereas in developed nations, prematurity is a major etiological factor, with term-born children accounting for the remaining cases. This disparity is attributed to the availability of excellent neonatal intensive care in affluent nations, which increases the survival rate of preterm infants, thereby contributing to the higher incidence of prematurity-related cerebral palsy in these regions.

CONCLUSION

The present study concluded that antenatal, perinatal and postnatal factors all play a significant role in the development of CP. The importance of judicious medical practices, like; antibiotic usage and managing maternal infections is highly recommended. A systematic approach to identifying and addressing potential risk factors could help in reducing the risks and improve outcomes for children with CP. We suggest for the need of continued focus on maternal and child healthcare to improve outcomes for children with CP. Further research and targeted interventions are necessary to address the complex needs of these children and their families, ultimately enhancing their quality of life.

REFERENCES

1. Cerebral Palsy Facts & Statistics. 2024. MyCerebralPalsyChild.org.
2. Jöud A, Sehlstedt A, Källén K, Westbom L, Rylander L. Associations between antenatal and perinatal risk factors and cerebral palsy: a Swedish cohort study. BMJ Open. 2020 Aug 7;10(8):e038453. doi: 10.1136/bmjopen-2020-038453. PMID: 32771990; PMCID: PMC7418660.
3. Taft L. Cerebral palsy. Pediatr Rev 1995;16:411- 418
4. Stavsky M, Mor O, Mastrolia SA, et al. Cerebral Palsy-Trends in epidemiology and recent development in prenatal mechanisms of disease, treatment, and prevention. Front Pediatr 2017;5:21. 10.3389/fped.2017.00021 [DOI] [PMC free article] [PubMed] [Google Scholar]
5. Himmelmann K, Uvebrant P. The Panorama of cerebral palsy in Sweden part XII shows that patterns changed in the birth years 2007-2010. Acta Paediatr 2018;107:462–8. 10.1111/apa.14147
6. Pschirrer R, Yeomans E. Does asphyxia cause cerebral palsy?. Semin Perinatol2000;24:215.220.
7. Ellenberg JH, Nelson KB. The association of cerebral palsy with birth asphyxia: a definitional quagmire. Dev Med Child Neurol 2013;55:210–6.
8. Himmelmann K, Ahlin K, Jacobsson B, et al. Risk factors for cerebral palsy in children born at term. Acta Obstet Gynecol Scand 2011;90:1070–81. 10.1111/j.1600-0412.2011.01217.x
9. McIntyre S, Taitz D, Keogh J, et al. A systematic review of risk factors for cerebral palsy in children born at term in developed countries. Dev Med Child Neurol 2013;55:499–508.
10. McIntyre S, Blair E, Badawi N, et al. Antecedents of cerebral palsy and perinatal death in term and late preterm singletons. Obstet Gynecol 2013;122:869–77.
11. Ramanandi, V.H., Shukla, Y.U. Socio-demographic and clinical profile of pediatric patients with cerebral palsy in Gujarat, India. Bull Fac Phys Ther 27, 19 (2022).
12. Türkoğlu G, Türkoğlu S, Çelik C, Uçan H. Intelligence, Functioning, and Related Factors in Children with Cerebral Palsy. Noro Psikiyatr Ars. 2017 Mar;54(1):33-37. doi: 10.5152/npa.2015.12676. Epub 2017 Mar 1. PMID: 28566956; PMCID: PMC5439469.
13. Banskota B, Shrestha S, Rajbhandari T, Banskota AK, Spiegel DA. A snapshot of 1001 children presenting with cerebral palsy to a Children's disability hospital. J Nepal Health Res Counc. 2015;13(29):31–7. 19.
14. Thapa R. Retrospective descriptive study of cerebral palsy in Nepal. J Autism Dev Disord.

2016;46(7):2285–91. https://doi.org/10.1007/ s10803-016-2757-x
15. Singhi P, Saini AG. Changes in the clinical spectrum of cerebral palsy over two decades in North India--an analysis of 1212 cases. J Trop Pediatr. 2013;59(6):434–40.
16. Chaudhary S, Bhatta NK, Poudel P, Agrawal J, Kalawar RPS, Jayswal JP. Profile of children with cerebral palsy at a tertiary hospital in eastern Nepal. BMC Pediatr. 2022 Jul 13;22(1):415. doi: 10.1186/s12887-022-03477-x. PMID: 35831826; PMCID: PMC9277817.
17. Wang Y, Huang Z, Kong F. Parenting stress and life satisfaction in mothers of children with cerebral palsy: the mediating effect of social support. J Health Psychol. 2020;25(3):416–25.
18. Ribeiro MF, Sousa AL, Vandenberghe L, Porto CC. Parental stress in mothers of children and adolescents with cerebral palsy. Rev Lat Am Enfermagem. 2014;22(3):440–7
19. Bax M, Tydeman C, Flodmark O. Clinical and MRI correlates of cerebral palsy: the European Cerebral Palsy Study. Jama. 2006 Oct 4;296(13):
20. Dex S, Joshi H. *Children of the 21st Century: From Birth to Nine Months.* Bristol, England: Policy Press;2005.
21. Abdullahi, H., Satti, M., Rayis, D.A. *et al.* Intra-partum fever and cerebral palsy in Khartoum, Sudan. *BMC Res Notes***6**, 163 (2013).
22. Hagberg B, Hagberg G, Beckung E, Uvebrant P: Changing panorama of cerebral palsy in Sweden. VIII. Prevalence and origin in the birth year period 1991–94. Acta Paediatr. 2001, 90: 271-277.
23. Grether JK, Cummins SK, Nelson KB: The California cerebral palsy project. Paediatr Perinat Epidemiol. 1992, 6: 339-351.
24. Wu R, Gao Y, Zhang H, Chen Y, Tan F, Zeng D, Wan H, Yang Y, Gu J, Pei Z. Metabolic assessment of cerebral palsy with normal clinical MRI using 18F-FDG PET imaging: A preliminary report. Frontiers in Neurology. 2022;13.
25. Aggarwal A, Mittal H, Debnath S, Rai A. Neuroimaging in [13] cerebral palsy - report from North India. Iran Child Neurol J. 2013;7(4):41-46.
26. Sharma, N. ., &Dhande, R. . (2021). Magnetic Resonance Imaging (MRI) of the Brain in Cerebral Palsy Children. *Highlights on Medicine and Medical Science Vol. 6*, 23–36. https://doi.org/10.9734/bpi/hmms/v6/9369D
27. Meeraus WH, Petersen I, Gilbert R (2015) Association between Antibiotic Prescribing in Pregnancy and Cerebral Palsy or Epilepsy in Children Born at Term: A Cohort Study Using The Health Improvement Network. PLoS ONE 10(3): e0122034.
28. Nelson KB. Can we prevent CP? *N Engl J Med*. 2003;349:1765-1769.
29. Kulkarni R.S., Dr. Aditya. P. Kulkarni, & Dr. Rachana. R. Kulkarni. (2014). How Much of a Role Birth Asphyxia and Chronic Antenatal Hypoxia Disorders Have in the Genesis of Cerebral Palsy? Large Prospective Study of 31,804 Antenatal Mothers Followed up Till Delivery and 30,080 Live Births Observed in Sindhudurg District. *Global Journal of Medical Research*, *14*(H4), 43–48.
30. Venkatesh G, V Prakash, Sajjid M, Elango. Etiological and Clinical Profile of Seizures in Late Preterm and Term Neonates - A Retrospective Study in an Intramural Tertiary Care Centre. Asian J. Clin. Pediatr. Neonatol.2020;8(1):69-73.
31. Blair E, Stanley F. Issues in the classification and epidemiology of cerebral palsy. Ment Retard Dev Disabil Res Rev 1997;3:184.193.

How to cite this article: Dr Nidhi Khullar, Dr Vasundhara Bakshi, Dr Harpreet Singh, Dr Nanni Salathia, Dr Parmeet Kaur, ANTENATAL, PERINATAL AND POSTNATAL RISK FACTORS IN CHILDREN WITH CEREBRAL PALSY: A HOSPITAL-BASED OBSERVATIONAL STUDY, Asian J. Med. Res. Health Sci., 2026; 4 (1):639-644.
Source of Support: Nil, Conflicts of Interest: None declared.