

Etiological factors manifesting cerebral palsy in Pakistan: A narrative review

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ABSTRACT

Cerebral Palsy (CP) is an umbrella term for a group of neurological abnormalities that impair a person's ability to stand, balance, walk, and maintain posture. It is caused by injury or anomalies in the developing brain, which tend to happen before or soon after birth or in early childhood. This article gathered the pooled etiological factors of CP in different cities of Pakistan. An extensive search approach was developed using three search themes: Cerebral Palsy, Etiology, and Pakistan. The published literature from different databases (CINAHL, Cochrane Database, Google Scholar, NCBI-PubMed, and Scopus/Elsevier electronic) was searched with no publication date limitation. All titles and abstracts were reviewed, as well as full texts of relevant articles were gathered from cross-sectional, cohort, descriptive case studies, pilot, prospective, and retrospective studies of CP patients in Pakistan. Birth asphyxia is depicted as a major etiological factor for the manifestation of CP reported in various cities of Pakistan. The etiology implicated in CP is discussed in detail along with the directions for future research.

Keywords: Cerebral Palsy, Etiology, Pakistan

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Introduction:

Cerebral Palsy (CP) is an umbrella term for a group of neurological abnormalities that impair a person's ability to stand, balance, walk, and maintain posture. (1) It is caused by injury or anomalies in the developing brain, which tend to happen before or soon after birth or in early childhood. (2) Aside from motor problems, behavioral disorders, cognitive impairments, epilepsy, sensory disturbances, drooling, dysphagia, insomnia, mental retardation, oral health issues, urinary and stool incontinence, and visual impairment may exhibit in individuals affected with CP. (3-5) Worldwide, the incidence of CP ranges between 1-6 out of 1000 live births. (6-8) CP affects males more than females. (9) Prevalence rates of CP in Asian countries can range from 1.5 to 4 per 1,000 live births, (6) based on various studies and data available. Neighboring countries of Pakistan, such as India, Afghanistan, Iran, and China, have varying prevalence rates of CP but in Pakistan the

burden of CP is unknown. (10)

CP etiology is complex, unique, multifaceted, and unknown. (2) Identifying the precise cause is critical for assessment, genetic counseling, treatment, and recurrence risk. (2) Prenatal causes account for 70-80% of CP cases, which include cervical insufficiency, consanguinity, deficiency of iodine, epilepsy, gestational diabetes, hypertension, hyperthyroidism, intrauterine infections, intravenous clotting, mental retardation, multiple pregnancies, placental anomalies, and pregnancy toxication. (10-12) Perinatal causes account for 10-20% of CP cases, which include asphyxia, chorioamnionitis, cord wandering, early membrane rupture, low APGAR scores, low birth weight, placenta previa, placental infarction, premature birth, and vaginal bleeding. (13) Postnatal causes account for 10% of cases which include CNS infection, coagulopathy, convulsions, encephalopathies, hyperbilirubinemia, hypoglycemia, intracranial hemorrhage, and polycythemia. (11,14) CP affects over 17 million people worldwide, but its epidemiology and etiology in Pakistan is yet to be identified. (15,16)

Although CP is a lifelong impairment, several interventions can assist in lessening its impact on the body and activities of daily life. (1) Healthcare providers have utilized a variety of interventions to deal with behavioral and emotional issues, bowel problems,

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controlling pain, drooling, dysphagia, epilepsy, hearing and vision problems, Insomnia, intellectual disability, movement issues, problems with communication, and spinal and hip abnormalities in individuals affected with CP.(17) CP-specific early enriched environment techniques have shown modulation of behavior, cognition, and spasticity in three spastic diplegics CP children.(17) Every case of CP is unique. The application of interventions varies based on underlying etiological factors, the extent of impairment, the type of CP, and associated conditions.(2) Therefore, diagnosing etiological factors is crucial for handling each individual case.(16)

CP is a significant health concern in Pakistan and neighbouring countries, efforts to improve prenatal care, access to healthcare services, and awareness about risk factors can contribute to reducing its prevalence and improving the quality of life for individuals affected by CP. Understanding the etiology of CP in Pakistan is crucial for several reasons including early detection

and intervention, healthcare planning and resource allocation, public health initiatives, advocacy and policy development, research and innovation, as well as social awareness and stigma reduction. There is an urgent need to collect data on CP etiology from various cities in Pakistan in order to facilitate the formulation of health policies for the early identification and treatment of CP in the country. This is the first article that presents an overview of Pakistani literature on CP's etiology.

This etiological review can to help identify gaps in knowledge and research to guide future studies and to direct resources towards areas that require further investigation.

Methods and Results:

An extensive search approach was developed using three search themes: Cerebral Palsy, etiology, and Pakistan (i). The published literature from different databases (CINAHL, Cochrane Database,

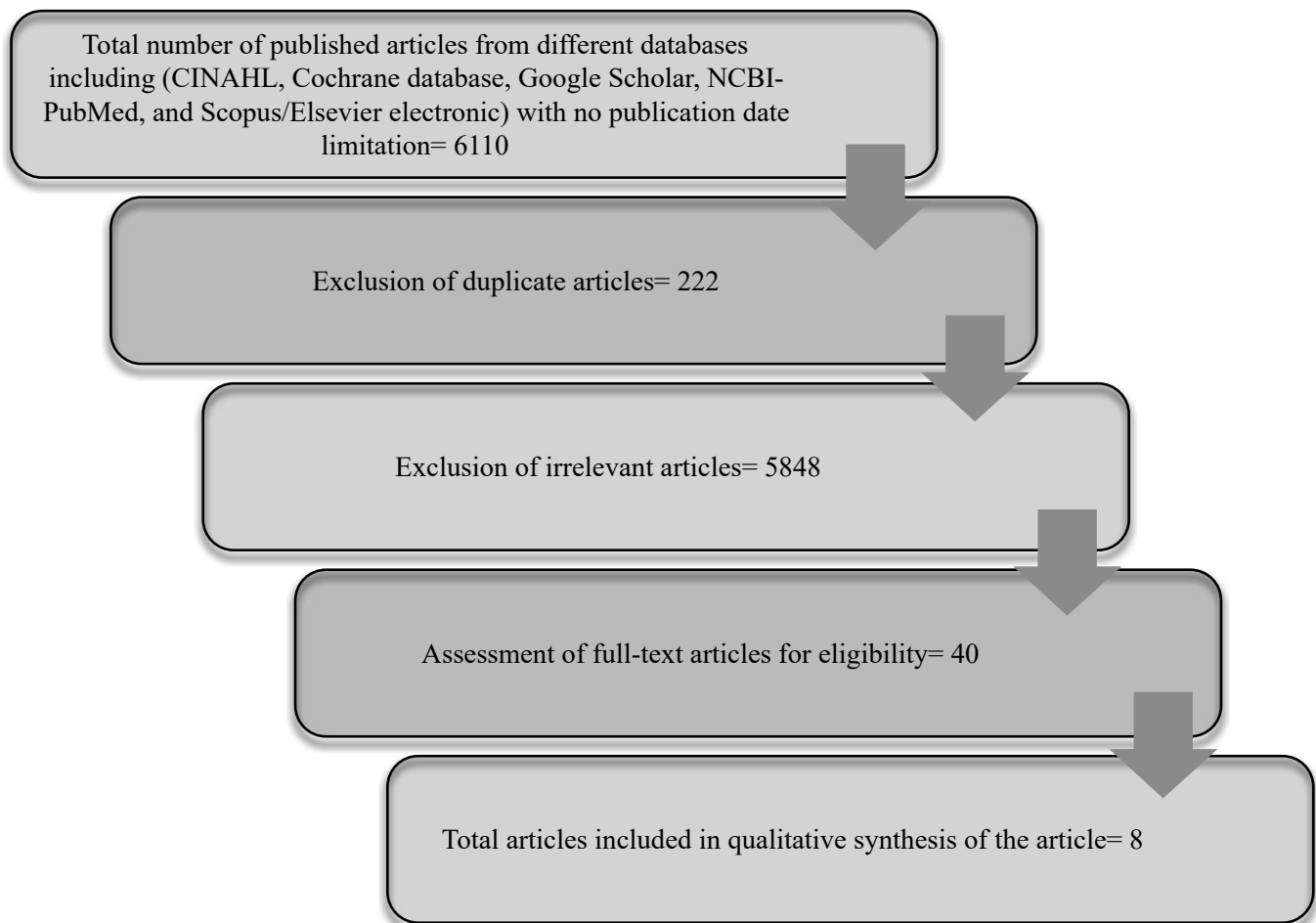


Figure 1: Summary of the literature review– screening, assessment, and selection of relevant research for the qualitative synthesis of the article

Google Scholar, NCBI-PubMed, and Scopus/Elsevier Electronic) was searched with no publication date limitation to examine the etiology of CP reported in different cities of Pakistan. All titles and abstracts were reviewed, as well as full texts of relevant articles were gathered from cross-sectional, cohort, descriptive case studies, pilot, prospective, and retrospective studies of CP patients in Pakistan. Two independent reviewers conducted blinded, standardized eligibility screenings for the studies. Titles and abstracts were reviewed, and duplicate papers were removed. Full-length papers were obtained after evaluating the titles and abstracts (Figure 1).

Reported Etiological Factors

A total of 1120 patients were examined in this article. A handful of researchers have contributed to the collection of data in various cities, including Faisalabad,(18) Gujranwala,(19) Islamabad,(20) Karachi,(7,9,21) Mansehra,(22) and Rawalpindi.(23) (Table 1, Figure 2) There is a shortage of high-quality research on CP in Pakistan, making it difficult to define common etiological causes. Establishing a national registry for CP data gathering is an important first step towards preventing CP in Pakistan's future generations.

In the extracted data, asphyxia in neonates was depicted as a major etiological factor for CP manifestation,(18-21,23) but how it leads to CP is controversial. Birth asphyxia, also known as perinatal or neonatal asphyxia, occurs when the child's brain does not get sufficient oxygen during delivery. Reduced oxygen supply to the child's brain results in brain cell damage. The severity of the damage and the areas of the brain affected may vary, resulting in different types and degrees of CP.(8)

Researchers have linked prenatal causes to CP in the majority of cases,(10-12) with birth asphyxia contributing to a smaller role (>10% of diagnosed CP cases).(13,24) Others have found that birth asphyxia is one of the main causes, accounting for more than 30% of CP cases.(25-27) Prenatal asphyxia must be prevented and treated to prevent development of CP in newborns.(26)

Birth asphyxia is a widely recognized cause of morbidity as well as mortality among newborns.(28,29) Birth asphyxia causes a stoppage of blood supply to the placenta, resulting in ischemia and hypoxia. If hypoxia-ischemia persists, it may give rise to neurodevelopmental problems including CP or delays in development.(30,31) The research found that less



Figure 2: Mapping of publications from various cities in Pakistan

Table 1: Etiological factors of CP reported from various cities in Pakistan

Reference	City in Pakistan	Study design	Number of cases	Reported etiological factors
(18)	Faisalabad	Prospective study	120	Birth Asphyxia was the main cause in 36% of cases, followed by meningoencephalitis in 34% of cases, prematurity and low gestational weight in 8% of cases, kernicterus in 5.5% of cases, and intracranial bleeding in 2.5% of cases.
(19)	Gujranwala	Descriptive retro-prospective study	69	Inadequate prenatal and natal care, which results in birth asphyxia and infections of CNS are the major causes of CP.
(20)	Islamabad	Cohort	89	42.7% of cases exhibited birth Asphyxia, which resulted in Hypoxic-ischemic injury to the developing brain.
(7)	Karachi	Pilot cross-sectional study	20	The major risk factors reported were home birth in 75% of cases, consanguinity in 50% of cases, infections in 40% of cases, and a lack of prenatal care in 30% of cases.
(10)	Karachi	Retrospective cohort study	120	Prenatal factors reported in 75.8% of cases including fetal distress in 0.83% of cases, hydrocephaly in 0.83% of cases, a low gestational weight in 35.8% of cases, maternal problems in 13.3% of cases, microcephaly in 0.83% of cases, insufficient placental supply in 1.66% of cases, periventricular leukodystrophy, in 0.83% of cases, periventricular leukomalacia in 0.83% of cases, preterm birth in 19.1% of cases, Rh incompatibility in 0.83% of cases, and toxoplasmosis, rubella cytomegalovirus, herpes simplex, and HIV (TORCH) infections in 0.83% of cases.
(21)	Karachi	Cross-sectional survey	300	Birth Asphyxia was the most common etiological cause of CP in one-third of children.
(22)	Mansehra	Cross-sectional survey	300	Anemia in mothers and delayed crying in children were revealed as substantial risk factors for CP.
(23)	Rawalpindi	Descriptive case series	102	The most common etiological cause of CP was birth Asphyxia in 32.4% of cases, followed by prematurity in 26.5% of cases, kernicterus in 12.7% of cases, and meningoencephalitis in 10.8% of cases.

than 3% to more than 50% of CP cases exhibited birth asphyxia.(27) Internationally, metabolic acidosis in the umbilical cord is a mandatory criterion for diagnosing intrapartum hypoxia(32,33) and asphyxia .(34) As a result, the pH of blood in the umbilical cord was used to determine the case exposure rates that relate birth hypoxia to CP manifestation. The precise diagnosis of birth asphyxia in neonates remains a challenge in linking asphyxia to CP.

Conclusion:

Birth asphyxia is depicted as a major etiological factor for the manifestation of CP reported in various cities of Pakistan. It was also identified that most of the research is related to the epidemiology or intervention of CP. Furthermore, a dearth of high-quality studies on the etiology hinders the ability to conclude widespread etiological factors influencing CP expression in Pakistan. Data on the etiological causes of CP are critical for a thorough understanding of this condition, for prevention, early intervention, and more effective support for individuals affected with CP. Creating a comprehensive database of patients, whether computerized or manual, is a commendable initiative that has the potential to effectively improve CP management and prevention in Pakistan.

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Authors Contribution:

Rafique A: Conception, data collection, interpretation, manuscript writing, critical review

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