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Research Article

Risk factors and comorbidities in cerebral palsy patients aged 6 months to under 5 years

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Abstract

Background: Cerebral palsy (CP) is the most common motor disability in children. This study aimed to evaluate the risk factors and comorbidities associated with CP in children aged 6 months to 5 years. **Patients and Methods:** The study included 44 children diagnosed clinically to had cerebral palsy, a detailed history of antenatal, natal, and postnatal events was taken, a thorough physical, developmental, and neurological examination was performed, clinical assessment of possible comorbidities was carried out. **Results:** The commonest type of the studied CP children was hypotonic CP. Muscle strength assessed by the Medical Research Council MRC scale ranged from 30 to 60 with a mean of 37.43 (SD: ± 11.92). 34.1 % of patients had at least one risk factor, 61.4% had multiple risk factors, and 4.5% had unidentified risk factors. The majority of children had natal and postnatal risks (77.3%, and 47.7% respectively). The neonatal intensive care unit (NICU) incubation and cesarean section mood of delivery are the most frequent natal risk factors (56.8% for both), followed by low birth weight (43.2%). Intellectual disability was the commonest comorbidity in 95.5% of patients (43.2% had mild form, and 52.3% had severe form) followed by musculoskeletal disorders and epilepsy in 63.6% and 15.9% respectively. **Conclusion:** The most common risk factors in children with cerebral palsy were natal and postnatal factors, while the most common comorbidity is intellectual disability followed by musculoskeletal disorders and epilepsy. There is a need for longitudinal studies that would assess comorbidities over time for patients with CP.

keywords: Cerebral palsy, Risk factors, Comorbidities, Motor impairment

Introduction

Cerebral palsy (CP) is the most prevalent childhood motor disability [1]. CP refers to a collection of permanent impairments of movement and posture development that cause activity limitations and are caused by nonprogressive problems in the developing fetal or infant brain. The motor impairments of CP are frequently accompanied by secondary musculoskeletal issues, seizures, and disturbances of sensation, perception, cognition, communication, and behavior. [2].

According to population-based studies, the prevalence of CP is estimated to be 1 to 4 per 1000 live births worldwide [3]. In Egypt, in people aged 4 to 48, El-Tallawy et al., [4] observed a prevalence rate of more than 3 per 1,000 live births.

The development of CP is influenced by a number of prenatal, natal, and postnatal circumstances. The majority of impacts on the brain occur during the months before birth. Perinatal hypoxia and other intrapartum conditions contribute to the development of CP, which is more prevalent in underdeveloped nations. Prematurity also became a significant concern since preterm newborns are living longer because of improved medical services.

Anemia, infections, and maternal malnutrition are some of the things that can be avoided.[5].

The topographical classification divides CP patients into monoplegia, diplegia, triplegia, quadriplegia, paraplegia, and hemiplegia, indicating involved extremities. The physiological classification divides CP patients into spastic, dyskinetic, hypotonic, and mixed types on the basis of major motor abnormality. Epilepsy, speech, hearing, visual impairment, oromotor dysfunction, and intellectual disability are frequently present comorbidities in addition to movement and motor dysfunction[5].

The purpose of this study was to identify the comorbidities and risk factors for cerebral palsy in children between the ages of 6 months and under 5 years.

Patients and methods

This was a cross-sectional descriptive study. In the period from May 2022 to December 2022, forty-four CP patients were sequentially recruited from the Physical Medicine Unit, Outpatient Clinic of the Rheumatology and Rehabilitation Department, and Outpatient Clinic of the Pediatric Department at Minia University Hospital. Our study's definition of cerebral palsy was adapted from that of the International Workshop on Definition and Classification of Cerebral Palsy [6]. All of the parents or carers gave their informed consent. The ethics committee of the Faculty of Medicine gave the study their approval.

All patients fall within the previously mentioned definition and, youngsters' children between the ages of six months and five years were included in this study after getting a thorough history from the mother or other primary carer, a thorough physical, neurological, and developmental assessment was performed. Muscle strength is measured using the Medical Research Council (MRC) Scale, with grades ranging from normal to no apparent contraction [7].

Risk factors have been categorized down into prenatal, natal, and postnatal categories based on when the brain became damaged. The terms antenatal, natal, post-natal, and post-neonatal relate to the time from the beginning of labour through the 28th day of life, respectively. Post-neonatal refers to the time from day 29 to two years of age [8].

The rheumatologist and pediatrician did clinical assessments of common comorbidities including epilepsy, vision, hearing, speech, orthopedic issues, and intellectual disability and sought advice from specialists in ophthalmology, otorhinolaryngology, orthopaedics, and psychology.

A questionnaire that was completed by the families of the youngsters was used to calculate their estimated IQ scores. The form was adapted from the SPARCLE project's disability form. The ICD 10 is used to define the IQ ranges. Learning disabilities were classified as mild in youngsters with IQs between 50 and 70 and severe in those with IQs under 50 [9].

Statistical analysis

Simple descriptive statistics (mean and SD, percentage) were used in the statistical analysis, which was conducted using the SPSS (Statistical Package for Social Science) program version 20.0.

Results

The present study included 44 patients with CP with ages ranging from 6 months to <5 years (mean age: 2.39 years and SD: ±1.29 years). The sociodemographic and clinical characteristics of children with CP are summarized in Table 1. Hypotonic CP is the commonest type of cerebral palsy followed by spastic quadriplegic. Muscle strength assessed by the MRC scale ranged from 30 to 60 with a mean of 37.43 (SD: ± 11.92).

The assessment of risk factors for CP showed that 15 children (34.1 %) had at least one risk factor, with 27 children (61.4%) identified as having multiple risk factors while 2 children (4.5%) had unidentified risk factors. The majority of children had natal risks (77.3%), as shown in Table 2. Admission to NICU and C-section delivery are the most common natal risk factors (56.8% for both), followed by low birth weight (LBW) < 2,500 kg (43,2%), respiratory distress (25%), prolonged labor (22.7%), hyperbilirubinemia (20.5%), prematurity (18.2%), and infection (2.3%).

Most of the children with CP had some form of comorbidity as shown in Table 3. Intellectual disability was the commonest comorbidity in 42 (95.5%) of patients followed by musculo-skeletal disorders and epilepsy in 63.6% and 15.9% of cases respectively.

Out of 44 children with CP, 19 (43.2%) had mild cognitive impairment, and 23 (52.3%) had severe cognitive impairment. Figure 1 shows the musculoskeletal disorders found in our study. The knee contracture was the most common (54.5%), followed by the gastrocnemius contracture (43.2%).

The treatment approach in CP patients included physical therapy, pediatric Neurotherapy, and speech therapy. 9 (20.5%) of patients were taking oral muscle relaxants and 7 (15.9%) of patients were taking anticonvulsant drugs.10 (22.7%) of patients applied physical therapy, 11 (25%) applied pediatric neuro therapy and 3 (6.8%) applied speech therapy. 4(9.1%) applied orthopedic surgery.

Table 1: Sociodemographic and clinical characteristics of children with cerebral palsy

Variable range (mean ± SD) / n (%)		Patients (n = 44)
Age (years)		0.5-<5 (2.39±1.29)
Sex	Male	27 (61.4%)
	Female	17 (38.6%)
Residence	Urban	10 (22.7%)
	Rural	34 (77.3%)
Consanguinity	Positive	29 (65.9%)
	Negative	15 (34.1%)
Gestational age/weeks	Full-term (> 37 weeks)	33 (75%)
	Preterm (< 37 weeks)	8 (18.2%)
	Post-term (> 42 weeks)	3 (6.8%)
Motor type of CP	Hypotonic	24 (54.5%)
	Spastic	16 (36.4%)
	Mixed	4 (9.1%)
Topographic distribution of spastic and mixed CP	Hemiplegic	1 (2.3%)
	Diplegic	7 (15.9%)
	Quadriplegic	12 (27.3%)
MRC scale		30-60 (37.43±11.92)

CP= cerebral palsy, MRC= Medical Research Council

Table 2: Risk factors in children with cerebral palsy

Variable n (%)	Patients (n = 44)
Antenatal factors	11 (25%)
- Placenta complication	6 (13.6%)
- Pregnancy-induced hypertension	3 (6.8%)
- Diabetic mother	2 (4.5%)
Natal factors	34 (77.3%)
- Admitted at NICU	25 (56.8%)
- C-section	25 (56.8%)
- Low birth weight < 2,500 kg	19 (43,2%)
- Respiratory distress	11 (25%)
- prolonged labor	10 (22.7%)
- Hyperbilirubinemia	9 (20.5%)
- Prematurity	8 (18.2%)
- Infection	1 (2.3%)
Postnatal factors	21 (47.7%)
- Poor breastfeeding	9 (20.5%)
- Seizure	7 (15.9%)
- Infection	5 (11.4%)
- Trauma after delivery	1 (2.3%)
Unidentified risk factor	2 (4.5%)

NICU=neonatal intensive care unit, C-section=cesarean section, kg=kilo gram**.**

Table 3: Comorbidities in children with cerebral palsy

Variable n (%)	Patients (n = 44)
Intellectual disability	42 (95.5%)
Musculoskeletal disorders	28 (63.6%)
Epilepsy	7 (15.9%)
Respiratory problems	2 (4.5%)
GIT disorders	3 (6.8%)
Vision disorders	3 (6.8%)

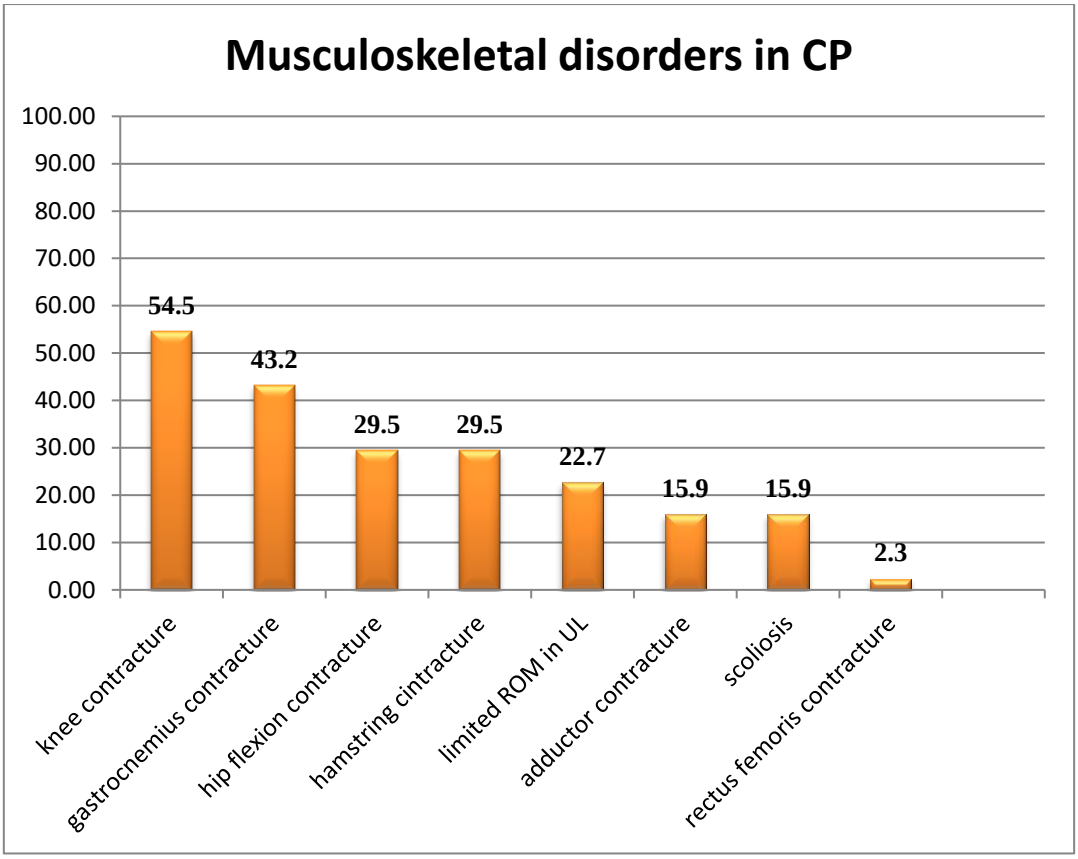

Figure 1: Musculoskeletal disorders in children with cerebral palsy.

Discussion

The current study discussed the comorbidities and risk factors related to children with CP, Understanding the likely risk factors that can develop CP is crucial because it is the most widespread type of persistent motor impairment in children. In this study, the majority (61.4%) of the children were male and were under the age of five. Men predominate, according to earlier studies from Nepal [10]. This is consistent with the fact that men are naturally more prone to acquiring CP than women are, and that the ratio of men to women hasn't changed considerably through time [11,12].

In this study, the hypotonic (54.5%) and spastic (36.4%) CP subtypes were most prevalent. Hemiplegia and diplegia occurred far less frequently. Compared to other research, their findings showed that spastic quadriplegia was the most prevalent topographical type and was responsible for 56.6% of cases. The second most frequent kind, spastic diplegia (16.11%), was seen [13,14,15]. Due to the presumption that the majority of hypotonic CP are thought to develop other motor types later in life or receive a diagnosis of a different ailment that is not covered by the term CP, several studies do not consider hypotonic children as a subtype.

In this study classified risk factors according to the time of injury into (antenatal, natal, and postnatal). Majority of children with CP, a risk factor was identified. Natal and postnatal risk factors were most frequent in this study (77.3%, and 47.7% respectively). NICU admission and C-section delivery (both 56.8%) are the most common natal risk factors. Many studies found an association between CP and emergency CS [16].

In agreement with this results, Abd Elmagid and Magdy [17] who reported that a greater percentage of cases (30.5%) had natal and postnatal risk factors, followed by prenatal risk factors (21%), post-neonatal risk factors (17.1%), and cases (31.1%) in which no reliable risk factor could be identified. Similar to

previous studies 75% of the patients in the current study were full-term births[18].

Among CP children in the present study, LBW and premature delivery accounted for 43.2% and 18.2%, respectively. In agreement with our results, Abas et al.,[19] identified LBW and premature delivery as natal risk factors in 26.5% and 16%, respectively. However, these figures are low in comparison to international figures (78%) reported in developed countries[20]

In this study, respiratory distress, and prolonged labor were identified in CP children (25%, and 22.7% respectively). In agreement with our results, Anwar et al., noted that prenatal asphyxia was documented in 53.6% of the cases of CP [21]. In addition, they noted that mothers of 43.6% of CP children had previously experienced difficult labor.

The SCPE follow-up research, which examined post-neonatal risk factors in CP patients from age 28 days to 25 months, is one of the few studies that analyzed these risk variables. The most typical risk factors were head injury, vascular events, and infection [22]. In this study, post-neonatal risk factors were identified in 21 patients (47.7%). The most frequent risk factor for the development of CP in the postnatal period was seizures, and the majority of these cases involved insufficient breastfeeding. Infection and pathological jaundice accounted for 20.5% and 11.4% of patients, respectively.

This study evaluated the antenatal risk factors includes some of the most common risk variables as placental complications, hypertension, and diabetes. Antepartum hemorrhage and hypertension were found to be responsible with 10% and 6%, respectively, of suspected etiological factors for CP in children in Central India, according to Gedam et al., [23]. Maternal anemia was listed by Pattar and Yelamali as a risk factor for CP, contributing to 17.7% of cases, followed by antepartum hemorrhage (5.5%), hypertension (4.4%), and infections (3.3%) [24].

This search identified intellectual disability as a comorbidity, musculoskeletal disorders, epilepsy, respiratory problems, and visual problems. Other comorbidities, such as learning difficulty, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorder (ASD), bowel and bladder issues, behavioral, emotional, and sexual issues, pain, and sleep issues with CP, have been mentioned in many of studies [25,26.27,28]. Different risk factors, CP types, facilities, and health-seeking behavior could all play a role in the variations in the distribution of the numerous comorbidities that have been documented.

This study showed that intellectual disability is the most commonly associated comorbidity which was reported previously by Study O'Callaghan ME et al., [29].

Conclusion: This study reported that various risk factors may contributed to cerebral palsy. The commonest risk factors are natal and postnatal, while the most common comorbidity is intellectual disability followed by musculoskeletal disorders and epilepsy. There is a need for longitudinal studies that would assess comorbidities over time for patients with CP.

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