MedCrave
Step into the World of Research
Journal of Pediatrics & Neonatal Care

Research Article
Open Access
CrossMark

Clinical presentation and management of children with cerebral palsy at a specialist children's hospital in Dubai, 2016-2020: a cross-sectional study

Abstract

Objectives: The aim of this study is to explore the epidemiology (e.g., point prevalence and possible risk factors) as well as the clinical presentation and management of cerebral palsy children who have been seen in a tertiary level children hospital between 2016 and 2020.

Methods: A proposal has been sent to and approved by Mohammad Bin Rashid University's Institutional Review Board in March 2021 before the collection and analysis of the data. The approval code is MBRU-IRB-2021-19. This descriptive cross-sectional study was conducted by collecting and analyzing secondary data of one-hundred cases of cerebral palsy patients. Selected files were of all patients with CP 2016- 2020 and variables included: subtypes of cerebral palsy (spasticity, dyskinesia, or ataxia), gestational age, birth weight, presented symptoms and clinical features, abnormal findings on brain MRI, and prescribed treatment.

Results: Point prevalence of children with CP was found to be 2.8 per 1,000 admissions during that timeframe, which is slightly higher than that seen worldwide. The patients were aged 1-17 with a mean age of 7.7 years ± 4.28SD, and the most common type of cerebral palsy is spastic diplegic CP making up 32% of the total motor types. The most common abnormal finding on brain MRI was white matter injury of the brain. Furthermore, other known risk factors, including low birth weight and preterm birth were investigated in the study.

Conclusion: Because of multiple associated conditions and complexities of support needed, management of CP is best done by a multidisciplinary team. Further research on the burden of cerebral palsy in children will help in the monitoring and delivery of cerebral palsy care in the future.

Key messages

What is already known about this subject?

i. Cerebral palsy (CP) is the most common motor disability in childhood with an overall prevalence of 2.11 per 1,000 live births worldwide.[6]

ii. The prevalence of CP is higher for children born preterm or at low birthweight.[6]

What does this study add?

i. This is the first descriptive cross-sectional study to be conducted in Dubai to estimate the point prevalence of cerebral palsy in children.

How might this impact public health and clinical practice?

i. This study aims to raise awareness of the condition by providing updated estimates of the burden of the disease; this will help in the monitoring and delivery of cerebral palsy care in the future.

ii. This study will also act as a base for many researchers to build on in the future.

Volume 13 Issue 3 - 2023

Meera AlShehhi,[1] Aya Mohsin,[1] Dr. Haitham El-Bashir[2]

[1]College of Medicine, Mohammed Bin Rashid University of Medicine and Health Sciences (MBRU), UAE
[2]Consultant pediatric neurorehabilitation, Head of Neurosciences Center of Excellence, Al Jalila Children's Hospital, UAE

Correspondence: Meera AlShehhi, College of Medicine, Mohammed Bin Rashid University of Medicine and Health Sciences (MBRU), Dubai, UAE, Tel +971 50 2424909, Email Meera.alshehhi@students.mbru.ac.ae

Received: November 24, 2023 | **Published:** December 08, 2023

Introduction

Cerebral palsy (CP) is a heterogeneous group of conditions involving permanent non-progressive motor dysfunction that affects muscle tone, movement, and posture, causing activity limitations.[1] These disorders are caused by anomalies in the growing fetal or infantile brain, which can be caused by a variety of non-progressive factors. Such factors include infection, hypoxia, trauma, and hyperbilirubinemia; biochemical and genetic factors may also be involved.[2] The clinical features of CP are diverse and enclose a broad range of abnormalities, predominantly motor disabilities, others like alterations in sensation or perception, intellectual impairment, communication and behavioral difficulties, seizure disorders, and musculoskeletal complications are all common symptoms that accompany primary motor abnormalities.[3]

CP may be classified into three main groups:[4]

1) Spastic, characterized by increased muscle tone;

2) Dyskinetic, characterized by hypotonic, slow writhing movements (athetotic), abnormal postural control movements, swallowing difficulties, problems of speech and coordination;

3) Ataxic, characterized by involuntary movement, lack of balance and depth perception.[5]

CP is the most common motor disability in childhood with an overall prevalence of 2.11 per 1,000 live births worldwide.[6] In the United States, approximately 10,000 infants and babies are diagnosed with CP each year, and a further 1200-1500 are diagnosed at preschool age.[7] The prevalence of CP in the developing world is not well established but is estimated to be 1.5 - 5.6 cases per 1,000 live births.[6] Although there are no available studies to indicate the prevalence of CP in the United Arab Emirates (UAE), experience from practice indicates that it is comparable to that of Western populations.[8]

Clinical management of children with CP requires a collaborative inter-professional team approach to address the multiple health, function, and mobility problems that occur during the child's lifetime.[9] The team includes medical and rehabilitation health professionals to address the primary and secondary conditions associated with CP. The medical providers consist of primary care physicians and specialty providers including developmental pediatricians, orthopedic surgeons, neurologists, and pediatric physiatrists. The rehabilitation providers include physical therapists (PTs), occupational therapists (OTs), speech and language pathologists (SLPs), orthotics, biomedical engineers, and experts in adaptive equipment and assistive devices.[10]

Research in this field in the Arabian Gulf region, and especially in the United Arab Emirates (UAE), is lacking. Since neurodevelopmental disorders contribute to an enormous burden on quality of life, studies toward relating risk factors are largely warranted. This will therefore contribute to developing early precautionary measures.

Methods

Study design

The study was conducted and reported according to the STROBE guidelines.[11] A descriptive, cross-sectional study was conducted by collecting and analyzing secondary data from cases of cerebral palsy children who presented to Al Jalila Children's Hospital in the UAE, between 2016-2020.

Study settings

Al Jalila Children's Hospital (AJCH) is a tertiary pediatric hospital; the departments are sub- specialized into many units. The Rehabilitation Department at Al Jalila Children's is manned by a multi-disciplinary team that includes highly trained professionals with a variety of skills.

Study participants

The main inclusion criteria for this study were established to include all pediatric cases from 1 to 18 years of age that were diagnosed with CP at Al Jalila Children's in the allocated timeframe. A list of 366 patients was provided. The exclusions were patients with diagnoses other than CP (Figure 1).

Study variables

Sociodemographic variables were age, gender, and nationality of patients who were diagnosed with CP. Other variables included: subtypes of cerebral palsy (spasticity, dyskinesia, or ataxia), gestational age, birth weight, GMFCS score, presented symptoms and clinical features (vision and hearing impairment), abnormal findings on MRI, consanguinity, multiple gestations, and prescribed treatment (medication, physical therapy, or orthopedic interventions).

Data sources and measurement

Data were extracted from the electronic medical record of 100 selected patients. The data were tabulated using a Microsoft Excel Sheet where demographic data relevant to the study was included. All variables of interest were available on the system (Cerner).

Point prevalence was measured by dividing the number of identified patients with CP by the total number of in/outpatients admitted to Al Jalila Children's Hospital in the timeframe between January 2016 to December 2020. The Al Jalila Children's Hospital medical record system (Cerner) uses the ICD-10 codes for disease classification. Low birth weight (LBW) was defined as a birth weight of less than 2500 g, while prematurity was identified as infants born alive before 37 weeks of gestational age, according to the World Health Organization (WHO).[12] Gross motor function was classified according to the Gross Motor Function Classification (GMFCS).[13] High impairment was defined as the inability to walk (GMFCS IV-V), moderate impairment/walking with aids (GMFCS III), and low impairment/can walk independently (GMFCS I-II). The MRI classification (MRICS) of the SCPE was applied (Figure 2).[14] Multiple gestations were divided into (singleton, twin, higher multiples, and unknown). Other variables such as consanguinity, hearing and vision impairment, physical therapy, and speech and communication therapy were recorded as present or absent.

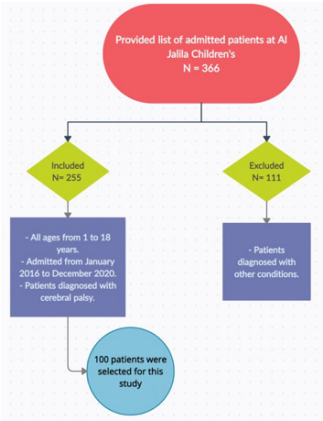

Figure 1 Breakdown of reviewed patients at Al Jalila Children's Hospital in the timeframe between January 1, 2016 until December 31, 2020.

A. Maldevelopments
A.1. disorders of cortical formation (proliferation and/or migration and/or organization)
A.2. other maldevelopments (examples: holoprosencephaly. Dandy Walker malformation, corpus callosum agenesis, cerebellar hypoplasia)

B. Predominant white matter injury
B.1. periventricular leucomalacia, PVL (mild/severe)
B.2. sequelae of intraventricular hemorrhage (IVH) or periventricular hemorrhagic infarction (PVHI)
B.3. combination of PVL and IVH sequelae

C. Predominant gray matter injury
C.1. basal ganglia/thalamus lesions (mild/moderate/severe)
C.2. cortico subcortical lesions only (watershed lesions in parasagittal distribution/multicystic encephalomalacia) not covered under C3
C.3. arterial infarctions (middle cerebral artery/other)

D. Miscellaneous
(examples: cerebellar atrophy, cerebral atrophy, delayed myelination, ventriculomegaly not covered under B, hemorrhage not covered under B, brainstem lesions, calcifications)

E. Normal

Printed with permission. IVH, intraventricular hemorrhage.

Figure 2 The MRI classification system.[12]

Biases

Although this cross-sectional study was designed to rule out as many biases as we could, however, the study may have been introduced to some biases along the way. For example, selection bias,

only patients admitted to Al Jalila Children's Hospital were included in this study and the variables studied were only those found in the medical records of patients. Moreover, recall bias may be introduced in history taking, some parents may not remember the birth weight of their child during the consultation.

Statistical methods

Data for analysis will be extracted from Al Jalila Children's Hospital medical records accessible and transferred to Statistical Package for Social Sciences SPSS, version 24 for statistical analysis. Categorical variables were summarized as frequencies and percentages (%).

Expected outcomes

Reliable and updated estimates of the burden and outcomes of cerebral palsy are vital for monitoring and improving the delivery and quality of CP care in any healthcare setting. It will also help raise awareness of the condition and help prepare programs for families and communities in the UAE. However, unlike many developed countries and the USA, the epidemiology of CP is unknown in the UAE, signifying the need for research in this area.

Therefore, this study aimed to provide the first estimates of the prevalence, clinical presentation, and management of CP at a tertiary-care hospital in the United Arab Emirates.

Results

The study sample consisting of 100 patients had an age group distribution ranging from 1 to 17 years old with a mean age of 7.7 years ±4.28SD. No missing data was recorded in terms of age. For gender distribution, 61 out of the 100 patients in this population were males and 39 were females. This shows that males represent 61% of the patients' sample during the study timeframe that is about, a 2:1 ratio of males to females. Local children were greater in number than non-local CP (non-UAE) children in the study sample, with 62% and 38% respectively. The point prevalence of cerebral palsy in patients that were admitted to AJCH between 2016-2020 was found to be 2.8 per 1,000 admissions (255/88314).

Birth weight is a key variable in this study and the results indicated that 32% of CP children were of low birth weight, while 25% were of normal birth weight. The total of cases with no reported birth weight, that is, unknown, was 43% (Table 1).

The gestational age at delivery, particularly the rate of preterm birth, was another key finding from these results where 48% of the patients in this sample were born preterm (<37 weeks' gestation). 36% of CP births were at term, with 16% of missing data (Table 2).

The most frequent diagnosed motor type and topography were also explored during the study. Spastic diplegic CP was the most common with 32%, however, there was no significant trend noticed in this data with only 2 reported cases of Athetoid CP and 1 reported case of Hereditary spastic paraplegic. A significant proportion (65%) of this data was classified as "unspecified". GMFCS score frequency was also looked at in this sample, where GMFCS of (IV-V) had 22%, and GMFCS of (I-II) had 15%, and GMFCS of (III) had 7%, while GMFCS in 56 patients was unknown (Table 3).

The distribution of abnormal neuroimaging patterns on MRI was also investigated. The most common findings were white matter injury (33%), miscellaneous (10%), and maldevelopment in (8%). Normal MRI findings were found in (6%) of the patients (Table 4).

For multiple gestations, singleton (80%) showed to be the most frequent, followed by twins (11%) and an unknown of (7%) (Table 5).

Consanguinity in patients, ranging from (21%) with present history of close relation marriage to (48%) of an absence of consanguinity (31%) of missing data was recorded (Table 6).

For the management of cerebral palsy, our data indicated that most of our patients would receive physical and occupational therapy (79%) and a less frequent speech and communication therapy of (30%) (Table 7 and 8).

Table 1 Number and percentage of children with CP by birth weight group (grams)

Birth weight					
		Frequency	Percent	Valid percent	Cumulative percent
Valid	<2500	32	32.0	32.0	32.0
	≥2500	25	25.0	25.0	57.0
	unknown	43	43.0	43.0	100.0
	Total	100	100.0	100.0	

Table 2 Number and percentage of children with CP by gestational age group (weeks)

% Prematurity					
		Frequency	Percent	Valid percent	Cumulative percent
Valid	22–36	48	48.0	48.0	48.0
	≥37	36	36.0	36.0	84.0
	not found	16	16.0	16.0	100.0
	Total	100	100.0	100.0	

Table 3 Number and percentage of children with CP by Gross Motor Function Classification System groups (levels I-II, III, IV-V)

GMFCS					
		Frequency	Percent	Valid percent	Cumulative percent
Valid	I–II	15	15.0	15.0	15.0
	III	7	7.0	7.0	22.0
	IV–V	22	22.0	22.0	44.0
	unknown	56	56.0	56.0	100.0
	Total	100	100.0	100.0	

Table 4 Distribution of neuroimaging patterns on brain MRI of children with CP

Neuroimaging patterns					
		Frequency	Percent	Valid percent	Cumulative percent
Valid	Maldevelopments	8	8.0	8.0	8.0
	Predominant white matter injury	33	33.0	33.0	41.0
	Predominant gray matter injury	6	6.0	6.0	47.0
	Miscellaneous	10	10.0	10.0	57.0
	Normal	6	6.0	6.0	63.0
	unknown	37	37.0	37.0	100.0
	Total	100	100.0	100.0	

Table 5 Number and percentage of children with CP by multiple gestations

Multiple gestation					
		Frequency	Percent	Valid percent	Cumulative percent
Valid	singleton	80	80.0	80.0	80.0
	twin	11	11.0	11.0	91.0
	higher multiples	2	2.0	2.0	93.0
	unknown	7	7.0	7.0	100.0
	Total	100	100.0	100.0	

Table 6 Number and percentage of consanguinity in patients with CP

Consanguinity					
		Frequency	Percent	Valid percent	Cumulative percent
Valid	yes	21	21.0	21.0	21.0
	no	48	48.0	48.0	69.0
	unknown	31	31.0	31.0	100.0
	Total	100	100.0	100.0	

Table 7 and 8 Number and percentage of children with CP that received Physical therapy and Speech and communication therapy

Speech and communication therapy					
		Frequency	Percent	Valid percent	Cumulative percent
Valid	No	53	53.0	53.0	53.0
	Unknown	17	17.0	17.0	70.0
	Yes	30	30.0	30.0	100.0
	Total	100	100.0	100.0	

Physical therapy					
		Frequency	Percent	Valid percent	Cumulative percent
Valid	No	15	15.0	15.0	15.0
	Unknown	6	6.0	6.0	21.0
	Yes	79	79.0	79.0	100.0
	Total	100	100.0	100.0	

Discussion

Summary of major findings

Point prevalence of cerebral palsy in patients that were admitted to AJCH between 2016-2020 was found to be 2.8 per 1,000 admissions. The results revealed that CP is male predominant with males making up 61% of patients, it was also evident that most of the patients were premature and had a low birth weight upon delivery. Emirati patients make up most of the cases and this can be due to the research being done in a hospital in the UAE where many patients were referred from other hospitals within the country. The most common abnormal finding on brain MRI was found to be of white matter injury of the brain. The patients were aged 1-17 with a mean age of 7.8, and the most common type of cerebral palsy is spastic diplegic CP making up 32% of the total motor types.

Comparison with previous studies

The prevalence of CP in children was 2.8 per 1,000 reported in our study between 2016-2020 was slightly higher than 2.08 in Europe from 2002,[15] 2.1 reported in Norwegian in 2006,[16] 2.26 in Northern Ireland from 2002,[17] 1.62 in Scotland from 2002.[17] However, when compared to regions of the middle east, 2.3 in Saudi Arabia from 2011 in a population-based study,[18] 3.6 in Al-Quseir City, Egypt from 2010-2011.[19] Results show similar ranges and that could be due to inherited causes such as genetic microcephaly and other syndromes associated with CP, perhaps due to consanguinity and close relation marriages which is common in the region.[20]

There is also a notable increase in multiple births and prematurity related to fertility therapy.[21] Babies born too early are at risk for intraventricular hemorrhage, i.e., bleeding in the brain. Periventricular

leukomalacia, which reflects injury to the white matter of the brain, is also more likely in babies born prematurely than in those born at term. Both intraventricular hemorrhage and periventricular leukomalacia increase the risk of CP.[22]

For gender, (61 out of 100, 61%) of the CP group were males and (39 out of 100, 39%) females, which reflects a higher occurrence of CP in males, and similar findings in a population-based study in Australia from 1995-2012 reporting CP in 57.5% males compared to 49.5% females.[23] The rate of cerebral palsy per 1000 male births (2.2, 99% CI 2.0 to 2.3) exceeds that among females (1.7, 99% CI 1.5 to 1.8) by about 30% in five European countries.[24]

In this study, spastic CP was the most common (32%). The other groups with athetoid (dyskinetic) accounted for 2% of cases while a case of hereditary spastic paraplegic (mixed) represented 1% of the cases. Level IV-V of GMFCS was more common, 22%.

In one study in a rehabilitation center in Tehran, Iran on 112 cases, the frequency of different types of CP were spastic [hemiplegic (36.6%), diplegia (31.3%), quadriplegia (12.5%)], atonic & hypotonic (12.5%), dyskinetic (4.5%), and mixed (1.8%).[25] In another study on 200 cases the frequency of different types of CP were spastic diplegia (39.5%), mixed (28%), spastic quadriplegia (22%), atonic (4.5%), dyskinetic (4%), and hemiplegic (2%).[26] Differences in the prevalence of subtypes may result from definition issues or ascertainment methods. Further classifications of the spastic subtype according to limb involvement (i.e., hemiplegia, quadriplegia, diplegia, triplegia, or monoplegia) have raised the problems of reliability.

However, other CP investigators also found that the distinction between spastic diplegia and spastic quadriplegia is particularly difficult.[27,28]

Implications for public health practitioners and clinicians

Cerebral palsy has no cure, practitioners can try to improve the quality of life of patients suffering from this disorder, understanding how most CP patients present and how they are managed will help formulate better treatment options, and raising awareness of the possible risk factors will make doctors more aware of ways to prevent the disorder. Having information on cerebral palsy will bring doctors closer to finding the best treatment for each individual case and understand the best ways to give these patients better standards of living.

Strengths, limitations, & generalizability

Cross-sectional studies are usually easy to conduct and inexpensive, there is already existing data from medical records of patients that were admitted to the hospital, this type of research is timesaving since there is no time wasted on waiting for patients to follow up. In this type of research, we can look at numerous patients at a point in time and compare. Since the data was from 2016 – 2020 we could see how patients presented later and how they were treated and improved with time.

As with every study, perfection is desired, however, there are obstacles and challenges at the time of conducting this study. The limitations in this study are as followed:

a. Despite the fact that the conducted study is internally valid, strictly to Al Jalila Children's Hospital; it's not yet externally valid. We are unable to generalize our data to the whole UAE population or compare it with other hospitals, clinics, or organizations.

b. Finding the prevalence of CP in Al Jalila only is not valid since the population would only be patients who are coming to this particular hospital, this creates a bias which is likely to increase the prevalence since the numerator is only patients admitted to this medical institution, to fix this gap we would have to find the amount of cerebral palsy patients in the UAE and put all the population as a denominator.

c. Many variables could not be found and were labeled as unknown because many CP patients were not originally born in Al Jalila Children's hospital, therefore, did not have a clear medical history, this reduces the authentication of the results, if all the variables were found, and the results would be more accurate.

d. The medical records of patients were packed with information, so it was time-consuming to try to find the exact data that is needed in-between multiple pages of notes, additionally, each clinician has a unique way of documenting medical notes which sometimes did not have the variables of interest.

Areas for future research

Many intervention approaches have been used in the treatment of CP, recently a question has been raised about the possibility of using stem cell therapy as a treatment method in clinical practice. The ultimate goal of this therapeutic intervention is to replace damaged tissue with the formation of new tissues by harnessing with the stem cells, which have a good regenerative capacity. Other interventions or approaches include acupuncture, neurodevelopmental training, sensory integration, electrical stimulation, suit therapy, hippotherapy, music therapy, and video game therapy. However, the evidence for effectiveness and recommendation for routine use of such interventions is equivocal and limited. This study pinned down some areas that could be improved for future research such as: having a bigger sample size to make the research results more accurate and having patients who have a clear birth history since many of our patients did not. Also, a different study design could be used to investigate outcomes of some of the treatment options that were given to patients since some of them failed to follow up. Furthermore, a study where all the UAE population is participating to find the accurate prevalence of CP in the UAE without any form of bias.

Conclusion

CP is the most common cause of motor abnormalities seen in infants and children. The point prevalence of CP in AJCH showed to be similar to that worldwide. Although prematurity and low birth weights are important risk factors, about half of all children who develop CP were born at term and with normal birth weight. The diagnosis of CP is based mainly on findings on history and physical examination of motor function. Because of multiple associated conditions and complexities of support needed, management of CP is best done by a multidisciplinary team.

Acknowledgments

We wish to extend our special thanks to our supervisor Dr. Haitham El Bashir from Al Jalila Children's Hospital and our supportive Professors of Epidemiology and Research at Mohammed Bin Rashed University of Medicine and Health Sciences (MBRU).

Funding

None.

Conflicts of interest

The authors declare that there are no conflicts of interest.

References

1. Vitrikas K, Dalton H, Breish D. Cerebral palsy: an overview. *Am Fam Physician*. 2020;101(4):213–220.
2. Scully CCR. *Neurological disorders I: epilepsy, stroke and craniofacial neuropathies*. Medical problems in dentistry. 5th Ed. 2011;297–298.
3. Novak I, Walker K, Hunt RW, et al. Concise review: stem cell interventions for people with cerebral palsy: systematic review with meta–analysis. *Stem Cells Transl Med*. 2016,5(8):1014–1025.
4. Dougherty NJ. A review of cerebral palsy for the oral health professional. *Dent Clin North Am*. 2009;53(2):329–338.
5. Alhashmi H, Kowash M, Al Halabi M. Medical and dental implications of cerebral palsy. Part 1 general and medical characteristics: a review. *JSM Dent*. 2017;5(2):1088.
6. Johnson A. Cerebral palsies: epidemiology and causal pathways. *Arch Dis Child*. 2000;83(8):279A.
7. United cerebral palsy research and education foundation (US). Cerebral palsy fact sheet. 2013;2–4.
8. Mohamed KA. Management of spastic cerebral palsy in the UAE: an overview. 2009;9(2):30–32.
9. Chan G, Miller F. Assessment and treatment of children with cerebral palsy. *Orthop Clin N Am*. 2014;45(3):313–325.
10. O'Neil ME, Lennon N. Therapy management of the child with cerebral palsy: an overview. *Springer Cham*. 2019;1–10.
11. Elm E, Altman D, Egger M. Strengthening the reporting of observational studies in epidemiology (STROBE) statement: guidelines for reporting observational studies. *BMJ*. 2007;335(7624):806–808.
12. Bramer GR. International statistical classification of diseases and related health problems. Tenth revision, 2nd Ed. *World Health Stat Q*. 1988;41(1):32–36.
13. Palisano R, Rosenbaum P. Development and reliability of a system to classify gross motor function in children with cerebral palsy. *Dev Med Child Neurol*. 1997;39(4):214–223.
14. Himmelmann K, Horber V. MRI classification system (MRICS) for children with cerebral palsy: development, reliability, and recommendations. *Dev Med Child Neurol*. 2017;59(1):57–64.
15. Surveillance of cerebral palsy in Europe prevalence and characteristics of children with cerebral palsy in Europe. *Dev Med Child Neurol*. 2002;44:633–640.
16. Andersen GL, Irgens LM, Haagaas I, et al. Cerebral palsy in Norway: prevalence, subtypes and severity. *Eur J Paediatr Neurol*. 2008;12(1):4–13.
17. Cans C, Cruz J, Mermet M. Epidemiology of cerebral palsy. *Paediatr Child Health*. 2008;18(9):393–398.
18. Al Salloum AA, El Mouzan MI, Al Omar AA, et al. The prevalence of neurological disorders in Saudi children: a community-based study. *J Child Neurol*. 2011;26(1):21–24.
19. El–Tallawy, Farghaly WM, Shehata GA, et al. Cerebral palsy in Al–Quseir City, Egypt: prevalence, subtypes, and risk factors. *Neuropsychiatr Dis Treat*. 2014;10;1267–1272.
20. Al–Gazali LI, Sztriha L, Dawodu A, et al. Pattern of central nervous system anomalies in a population with a high rate of consan– guineous marriages. *Clin Genet*. 1999;55(2):95–102.
21. Mansoor Ahmed. Director research & advisory (MENA Region) Healthcare, Education & PPP, Colliers. 2021.
22. Drougia A, Giapros V, Krallis N, et al. Incidence and risk factors for cerebral palsy in infants with perinatal problems: a 15–year review. *Early Hum Dev*. 2007;83(8):541–547.
23. ACPR Group. Report of the Australian cerebral palsy register, birth years 1995–2012. 2018.
24. Jarvis S, Glinianaia SV, Arnaud C, et al. Case gender and severity in cerebral palsy varies with intrauterine growth. *Archiv Dis Child*. 2005;90(5):474–479.
25. Sajedi F, Togha M, Karimzadeh P. A survey of 200 cases of cerebral palsy in welfare and rehabilitation centers of Tehran in respect of etiology, type and associated disorders. *Saudi J Disabil*. 2003;9(1):1–7.
26. Soleimani F, Hemmati S, Amiri N, et al. Cerebral palsy in Iranian children: etiology, types and associated disorders. *Middle East J Family Med*. 2008;6(7):24–29.
27. SCPE Collaborative Group. Surveillance of cerebral palsy in Europe: a collaboration of cerebral palsy surveys and registers. *Dev Med Child Neurol*. 2000;42(12):816–824.
28. Colver AF, Sethumadhaven T. The term diplegia should be abandoned. *Arch Dis Child*. 2003;88(4):286–290.

Citation: AlShehhi M, Mohsin A, El-Bashir H. Clinical presentation and management of children with cerebral palsy at a specialist children's hospital in Dubai, 2016-2020: a cross-sectional study. *J Pediatr Neonatal Care*. 2023;13(3):250–255. DOI: 10.15406/jpnc.2023.13.00528