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RESEARCH ARTICLE

REGISTRY OF CEREBRAL PALSY IN PORT SAID GOVERNORATE-EGYPT

[1,*]Mohamed H. Agramia and [2]Samia A. Abdel Rahman

[1]Physical Therapist at El Santa Governmental Hospital, El-Gharbeya, Egypt
[2]Department Physical Therapy for Pediatrics, Faculty of Physical Therapy, Cairo University, Egypt

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ABSTRACT

Back ground: The prevalence of cerebral palsyin developing country is high. It is one of the most common causes of childhood physical disability.
Purpose: To establish a registry of cerebral palsy in Port Said Governorate-Egypt.
Subject and Methods: One hundred twenty children with cerebral palsy of both genders who were receiving physical therapy in Port Said Governorate participated in the study. Their ages ranged from one month to 18 years. They were recruited from three public hospitals and four private centers in Port Said Governorate. They were subjected to confidential modified Australian Registry Form.This study was conducted from December 2017 up to March 2018.
Results: The findings revealed that the prevalence of CP children who received physicaltherapy services was 3/10000 live birth in Port Said Governorate. Boys represented 69.2% and girls represented 30.8% from total cases. The percentage of the types of cerebral palsy was about 91.6% spastic, 6.7% hypotonic and 1.7% dyskintic. According to Gross Motor Function Classification System; level V has the highest percentage. According to Manual Ability Classification Scale and Viking Speech Scale, level II has the highest percentage.
Conclusion: Prevalence of cerebral palsy in Port Said Governorate is low. Spastic type of cerebral palsy has the highest frequency.

INTRODUCTION

Cerebral palsy (CP) is a neuromuscular disorder caused by an injury to the fetal or infant brain that affects the development of movement and posture and causes activity limitations. The motor disorders of CP are often accompanied by disturbances of sensation, perception, cognition, communication, and behavior; by epilepsy; and by secondary musculoskeletal problems (Hurley *et al.,* 2015). One method to classify CP is to describe the predominant motor characteristics, which include spastic, hypotonic, athetotic, dystonic, and ataxic, as well as the topographical pattern of limb involvement, such as monoplegia, diplegia, triplegia, hemiplegia, or quadriplegia. A second method divides CP into two major physiologic classifications, pyramidal (spastic) and extra pyramidal (nonspastic), indicating the area of the brain that has been affected as well as the resulting predominant motor disorder (Jones *et al.,* 2007). Incidence can tell us how many new cases of a particular illness have been suffered by a community, or it might tell us how patterns of a condition within a population change over time. Incidence rates are the numbers of new cases of a disease within a specified period of time. They often refer to a birth cohort or longitudinal study and are therefore more difficult to study in resource-poor settings where follow-up and health access were difficult (Ashwal *et al.,* 2004). The CP Register is a database of clinical information about CP.

***Corresponding author:* Mohamed H. Agramia**
Physical Therapist at El Santa Governmental Hospital, El-Gharbeya, Egypt.

Information collected about each person with CP includes birth details, type and severity of CP, other associated impairments and parent demographics (Newton and Garner, 2002). The Cerebral Palsy Research Registry has been designed to assist CP research primarily by linking researchers with participants who qualify for research studies based on the study's inclusion and exclusion criteria and secondarily by creating pilot studies from the registry cohort data that can be later elaborated upon in larger, diverse studies. This is done by collecting medical, developmental, and social data on persons with cerebral palsy and their families and updating the participants' status year (Hurley *et al.,* 2015). Research on CP is of low priority in developing countries where infectious diseases such as human immunodeficiency virus (HIV), malaria and tuberculosis are common (Benedict *et al.,* 2011). The prevalence was recorded in different governorates in Egypt. Each governorate had a different prevalence of CP. Therefore; the purpose of this study was to establish registry of CP in Port Said Governorate, Egypt.

MATERIALS AND METHODS

Subjects

One hundred twenty children with CP of both genders participated in the study. Their ages ranged from one month up to18 years. All children with CP were recruited from three public hospitals and four private centers in Port Said

Governorate. Children were recruited according to the following inclusion criteria: a) diagnosed as CP, b) age ranged from birth up to 18 years, c) children who live in Port Said governorate, Egypt, d) children who receive physical therapy as a part of their management.

Materials

Australian Cerebral Palsy Register (ACPR) was used (Australian Cerebral Palsy Register, 2013). It uses validated measurement tools to record spasticity and functional severity of CP by Gross Motor Function Classification System (GMFCS) and Manual Ability Classification System (MACS) (Lee *et al.,* 2015). It includes clinical details of person with CP. Gross Motor Function Classification System (GMFCS) is a reliable and valid method for classifying functions among children with CP and is widely used in clinical settings. it is based on self-initiated movement, with emphasis on sitting, transfers, and mobility. It has five-level classification system.

Level I: Walks without restrictions (limitations in more advanced gross motor skills.
Level II: Walks without assistive devices (limitations in walking outdoors and in the community).
Level III: Walks with assistive mobility devices (limitations in walking outdoors and in the community).
Level IV: Self-mobility with limitations (children are transported or use power mobility outdoors and in the community).
Level V: Self-mobility is severely limited even with the use of assistive technology (Lee *et al.,* 2015).

Manual Ability Classification System (MACS) from 4 years till 18 years, focus on the child's ability to handle objects in important daily activities, for example during play and leisure, eating and dressing. Asking about the child's most usual performance and the ability to handle object needs to be considered from an age related perspective. The MACS contains five manual ability levels as follows;

Level 1: Handles objects easily and successfully.
Level 2: Handles most objects but with somewhat reduced quality and/or speed of achievement.
Level 3: Handles objects with difficulty (needs help to prepare and/or modify activities).
Level 4: Handles a limited selection of easily managed objects in adapted situations.
Level 5: Does not handle objects and has severely limited ability to perform even simple actions.

The differences between each level also help to specify the level which had the closest similarity to the child's manual abilities (Eliasson *et al.,* 2006). The Viking Speech Scale was developed for use with children aged 4 years and above. The Viking Speech Scale (VSS) has been developed to classify children's speech production. It has four levels: level I; speech is not affected by motor disorder, level II; speech is imprecise but usually understandable to unfamiliar listeners, level III; speech is unclear and not usually understandable to unfamiliar listeners out of context and level IV; speech is not understandable (Pennington *et al.,* 2010).

Procedures

Written consent forms from parents for participation of their children in this study as well as approval letter from the ethical committee of the Faculty of Physical Therapy, Cairo University were obtained to begin the study. This study was conducted from December 2017 up to March 2018. All children with CP were recruited from three public hospitals and four private centers in Port Said Governorate, Egypt. After approval, the aim of the study was explained to parents or caregivers. The children were then examined by the school's physician for the inclusion and exclusion criteria. Each eligible child participated in the study. The assessment of each CP child started by observation from the entrance to the room. The child was in comfortable environment to do different functional activities without any interruption according to their age with some motivation. Data collected through the assessment using ACPR. During session time; the type of CP was determined, any associated impairments was recorded and assessing the levels of motor function, manual ability and speech ability was performed through the use of GMFCS, MACS, and Viking speech scale. The total time of each session ranged from two hours to two and half an hour and some cases required more than one session according to case and his/her co-operation. The main collected information in this study were complications and medications during pregnancy, gestational age, chronological age, gender, birth weight, onset of CP, type of delivery, parent consanguinity, associated disorders, levels of motor function, manual ability and speech ability as well as the type of CP.

Statistical analysis

Data were analyzed using statistical package for social sciences (SPSS V-20). Data were presented as frequency and percentage. For qualitative data, chi-squared (χ^2) was used to examine the relationship between some variables. For all tests $P < 0.05$ was considered to be statistically significant.

RESULTS

The number of CP cases in Port Said Governorate, Egypt who receive physical therapy services was 120 children representing about 3/10000 live birth. Age of the participated children ranged from 1 month to 216 month (18 years old). The general characteristics of the participated children are presented in Table (1). The distribution of different types of CP among participants are presented in Figure (1). The levels of CP severity based on GMFCS, the levels of hand ability from 4 to 18 years based on MACS and the levels of speech ability from 4 to 18 years who were 45 children based on Viking speech scale are presented in Table (2). The results revealed a positive correlation between the onset of CP and the following characteristics; parental consanguinity, complication during pregnancy, delivery intervention and birth weight (Table 3). The results also revealed a positive correlation between manual ability level and birth weight (p=0.042) as well as between speech level and birth weight (p=0.001).

DISCUSSION

Port Said governorate is one of canal zone governorates of Egypt. It is located in the northeastern part of the country, on the Mediterranean Sea at the northern gate of the Suez Canal, making it the second most important harbor in Egypt. Its capital is the city of Port Said, it is the home of the Suez Canal Authority headquarters and the Lighthouse of Port Said (Wikipedia, 2018).

Table 1. Characteristics of the participated children

Variables		Frequency* (Percentage)
Complications during pregnancy	Yes	93 (77.5)
	No	27 (22.5)
Medications during pregnancy	Yes	82 (68.3)
	No	38 (31.7)
Gestational age	Less than 37 weeks	23 (19.2)
	From 37- 42 weeks	97 (80.8)
Chronological age in years	0-1	43 (35.8)
	1- 4	41 (34.2)
	4- 10	34 (28.3)
	10-15	2 (1.7)
Gender	Boys	83 (69.2)
	Girls	37 (30.8)
Birth weight in grams	Very low birth of weight (< 1000)	8 (6.7)
	Low birth of weight (< 1500)	70 (58.3)
	Normal birth of weight (2500-4200)	42 (35)
Onset of cerebral palsy	Perinatal	95 (79.2)
	Postnatal	25 (20.8)
Type of delivery	Normal	38 (31.7)
	Caesarian section	82 (68.3)
Parental consanguinity	Positive	35(29.2)
	Negative	85(70.8)
Associated disorders	Epilepsy	36 (30)
	Intellectual impairment	56 (46.7)
	Visual impairment	44 (36.7)
	Hearing impairment	39 (32.5)
	Speech disorders	100 (83.3)
	Swallowing problems	87 (72.5)

*The total number of the children is 120 children.

Table 2. Severity of cerebral palsy, manual ability and speech ability of the participated children

Levels	GMFCS		MACS		Speech*	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
I	1	0.8	8	17.4	11	24.4
II	14	11.7	22	47.8	23	51.2
III	23	19.2	3	6.5	11	24.4
IV	16	13.3	5	10.9	-	-
V	66	55	8	17.4	-	-
Total	120	100	46	100	45	100

GMFCS: Gross Motor Function Classification System.MACS: Manual Ability Classification System.
* Measured by Viking speech scale.

Table 3. Relationship between some characteristics and onset of cerebral palsy

Variables	Chi-square	Contingency Coefficient	P- Value
Consanguinity	4.50	0.190	0.03*
Complication during pregnancy	37.49	0.488	0.001**
Delivery intervention	3.582	0.170	0.05*
Birth weight	28.100	0.436	0.001**

* Significant at level less than (0.05); ** Significant at level less than (0.01).

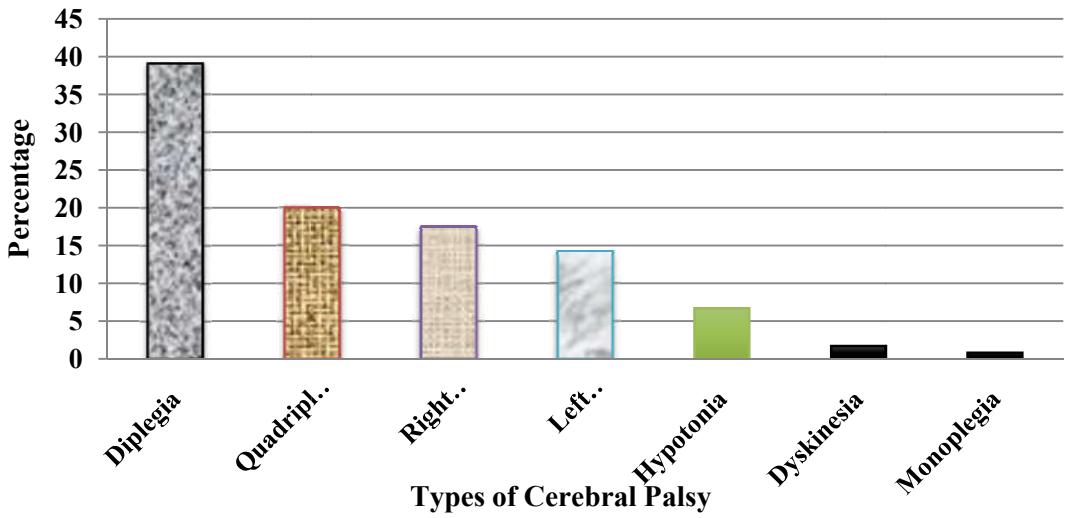

Figure 1. Distribution of the types of cerebral palsy among participants

There is no documented, or accurate data regarding the prevalence of CP in Port Said in according to the Directorate of Health. Therefore, this study may help public health official to determine actual size of the biggest problem facing the children. The total population in Port Said governorate was 749371 person in 2017 census. Total number of children up to the age of 18 years was 302901 of total population (target populations for this study) representing 40.42% of the total Port Said population (Central Agency for Public Mobilization and Statistics, 2017). The results of current study revealed that the prevalence of CP is 3/10000 live births. It is considered a low prevalence. This may be due to small total population in Port said Governorate. The prevalence was recorded in different governorates in Egypt. (El-Tallawy *et al.,* 2011 & 2014) recorded that the prevalence of CP was 2.03 and 3.6 per 1000 live births in Al-Kharga district and Al-Queir city respectively (Yasin and Abdalazim, 2016). Conducted a study at Banimazar district, Alminya governorate reported a prevalence of 1/1000 live births. In Damanhur, the prevalence was 0.8/1000 live births (Abdelwanees *et al.,* 2017; Nasef and Abdel Rahman, 2017). Also recorded that the prevalence of CP was 0.88/1000 live births in Kafrelsheikh city, Kafrelsheikh governorate (Radwan and Abdalazim, 2017). Also recorded that the prevalence of CP was 0.4 per 1000live birthsin Alexandria (Almontazah District) Egypt (Saeed *et al.,* 2017). Recorded that the prevalence of CP was 1.3 per 10000 live births in Alexandria (Wassat District) Egypt. Our findings revealed that about 77.5% of mothers had complications during their pregnancy which may be a predisposing factor for having a child with CP. This finding contraduct with that of (Mostafa *et al.,* 2017) who recorded only 26.9% of mothers had complications during pregnancy in Sohag city, Egypt. The results also revealed that 68.3% of mothers took medications during pregnancy which come in agreement with (Nasef and Abdel Rahman, 2017). who recorded that 94.4% of the mothers in thier study had drugs during pregnancy in Kafrelsheikh city, Kafrelsheikh governorate, Egypt. However, most of these drugs were taken to prevent abortion and miscarriage.

The results regarding the gestational age revealed a high percentage for the full term babies. [14]as well as[20]also reported high percentage for the full term babies among the participated children Bani Mazar, Minya and El-Gharbya governorate, Egypt respectively. Our results revealed that the percentages of the chronological age of all recruited CP children were 35.8%, 34.2%, 28.3% and 1.7% for less than 1 year old, from 1 to 4 years, from 4 to10 years and more than 10 years respectively. These results reflect the percentage of CP from birth to 1 year is the highest percentages. These may be returned to presence of advanced equipments for assessment as MRI, genetic analysis help in early diagnosis of these cases. This result were nearly similar to (Saeed *et al.,* 2017) reported that highest percentage of CP cases was aged from 6 months to less than 2 years in Alexandria (Wassat District) Egypt. The recorded results revealed that CP can occur in both genders; with higher frequency in boys than girls. In contradict with our findings, the prevalence rate of CP was higher among girls than boys in El-Kharga District- new Valley (El-Tallawy *et al.,* 2011) and in Kafrelsheik city, Kafrelsheikh governorate (Nasef and Abdel Rahman, 2017). They explained their results due by the neglection of periodic caring for mothers with girls sex of fetus. On the other hand, (Yasin and Abdalazim, 2016) reported that the ratio was and Abdalazim, 2017) also recorded that the ratio was higher among boys than girls in Alexandria governorate (Wassat District) and El-gharbya governorate, Egypt respectively. Very low birth weight (VLBW) is defined as <1500g, low birth weight (LBW) <2500g, moderate low birth weight (MBW) <2800g,and normal birth weight (NBW) >3000g (Hirvonen *et al.,* 2014; World Health Organization Package of Interventions, 2014) reported that the prevalence of LBW infants is 15% to 20% and common in developed countries. The data in this study demonstrated that 6.7%, 58.3% and 35% of all infants with CP were born with VLBW, LBW and NBW respectively. In other study of (Darwish *et al.,* 2016) at Imbaba, North Giza were 13.2%, 44.7%, 40.4% and 1.8% at VLBW, LBW, MBW and NBW respectively (Yasser *et al.,* 2017). Also reported that the LBW rate was 56.8%in Mit-Ghamer city, Egypt. However, (Mostafa *et al.,* 2017) recorded 55% of CP cases was normal birth weight and only 24.4% was low birth weight in Sohag city, Egypt. According to (Oskoui *et al.,* 2013) the patterns of CP in relation to birth weight show that infants of VLBW are between 20and 80 times more likely to have CP than infants of LBW (Michael *et al.,* 2004). Stated that the most important risk factor seems to be prematurity and LBW with risk of CP increasing with decreasing gestational age and birth weight, CP is seen in 10-18% of babies in 500-999 grams birth weight.

The results in this study revealed that perinatal onset was the highest percentage which agree with the study of [17], in Alexandria (Almontazah District), Egypt who recorded perinatal cases of 63.4%, and (Yasser *et al.,* 2017) who recorded perinatal cases of 52.3% in Mit-Ghamer city, Egypt. On the other hand, (Saeed *et al.,* 2017) reported that highest percentage of CP cases was postnatal onset in Alexandria (Wassat District) Egypt, and (Nasef and Abdel Rahman, 2017) recorded postnatal cases 55.1% in Kafrelsheikh city, Kafrelsheikh governorate, Egypt in Damanhure, El-Behera governorate, Egypt also recorded postnatal cases of 54.7% of all cases. Perinatal disorders include perinatal breathing disorders like perinatal hypoxia, congenital heart diseases and viral and bacterial infections (Thygesen *et al.,* 2016; Daher and El-Khairy, 2014) and (Daher and El-Khairy, 2014) stated that the underlying causes of the condition remain under debate and vary from medical mismanagement at birth to multifactor steps which form a series of causal pathways . The majority of cases of CP in this study were perinatal caused may be due to infection, surgery-related vascular incidents and low health care. The numbers of mothers with normal labor in this study were 38 mothers which represented 31.7% from all cases while caesarian section frequencywas82 mothers which represented 68.3% from all cases. This agree with the result of (Yasin and Abdalazim, 2016) in Bani_ Mazar, Minya, who reported37% and 63% for normal labor delivery and emergency caesarian section respectively (Saeed *et al.,* 2017). Also reported a highest percentage for caesarian section 68.7%in Alexandria (Wassat District) Egypt (Elmorsy and Abdalazim, 2017). Reported that caesarian section was 63% in El-Gharbya governorate, Egypt (Daher and El-Khairy, 2014). stated that for infants with CP, most of the caesarean deliveries were due to long labor, premature rupture of membranes, multiple births and fetal distress. Reasons included having all previous deliveries by caesarean section, loss of amniotic fluid, no contractions and the health of the mother. On the other hand, (Yasser *et al.,* 2017) stated that 56.8% for normal labor delivery and 43.2% for caesarian section. (Darwish *et al.,* 2016) reported that 51.8% for normal labor delivery and 48.2%for caesarian section. [16]alsoreported that 60.8% and 39.2% for normal labor delivery and caesarian section

respectively in Kafrelsheikh city, Kafrelsheikh governorate. The results in this study revealed that 29.2% of parents had positive consanguinity and 70.8% had negative consanguinity. (Yasser *et al.,* 2017) and (Altonoby *et al.,* 2017) reported a percentage of 37.9% and 35.7% respectively for positive consanguinity. (Kruer *et al.,* 2014) stated that at least 20% of cases are believed to be inherited. Positive consanguinity is not directly associated with incidence of CP, but it can be a predisposing risk factor and can enhance the overall risks. CP cases with genetic etiology at between 1 and 2%, and it's been argued that CP might be both genetic in origin as well as the results of environmental insult at any point throughout central nervous system development there could also be genes that have temporal or site-specific targets that act on the developing brain. Nowadays access to genetic diagnostic testing is restricted. There are a minimum of 20 completely different syndromes related to CP and its possible there are more genetic syndromes that stay unknown. Consanguinity is a social issue that needs to be addressed by government and non government agencies, and there's a necessity for awareness through education (Daher and El-Khairy, 2014). Children with CP usually had some associated impairments such as epilepsy, intellectual, visual, hearing and speech disorders with different percentages. In our study, about 30% from all cases had epilepsy, this finding was nearly similar with the results of (Altonoby *et al.,* 2017) who reported that percentage of epilepsy among the children of CP in their study was36.1%. (Nasef and Abdel Rahman, 2017) also reported about 49.4% of their cases had focal epilepsy with seizure manifestations. About 46.7% of the cases in our study has intellectual disability, (Nasef and Abdel Rahman, 2017) reported about 45.6% of cases had intellectual disability with different severity. (Australian Cerebral Palsy Register, 2016) recorded that the highest percentages of children with CP had no intellectual impairment which is supported by our results as about 53.3% of our cases has no intellectual impairment. For hearing disability in our study, 67.5% of CP cases had no impairment that come in agreement with (Nasef and Abdel Rahman, 2017) who reported about 65.8 % of CP cases had no hearing impairment and (Altonoby *et al.,* 2017) who reported 84% of CP cases had no hearing impairment. The percentages of speech disorder among of CP cases in this study were 83.3%. (Altonoby *et al.,* 2017) reported 70.5% of CP cases had speech disorder.

The results in this study demonstrated that higher rates of spastic CP. This agree with the findings of (Blair *et al.,* 2001) who reported that spasticity is predominant in CP children occurring from 77% to 92%. (Darwish *et al.,* 2016) in Imbab, Giza stated that spasticity is predominant in CP children which represented 77.2% from all cases, and similar to the findings of (Nasef and Abdel Rahman, 2017) in Kafrelsheikh city, Kafrelsheikh governorate who stated that spasticity is predominant in CP children which represented 82.3%from all cases. According to GMFCS findings, the results revealed that level V represents the highest prevalence followed by level III and level I represents the lowest prevalence among the participated children. These results were consistent with Pfeifer *et al.,* (2009) who reported that most of spastic children were level IV and V according to GMFCS but the results differed with[(14)] who recorded that 9.5%, 22,5%, 33%, 19.5%, 15.5% respectively in Bani_Mazar, Minya. Regarding manual ability assessed by MACS, our findings showed that level II has the highest prevalence followed by level I that may be due to the high frequency of spastic hemiplegia and diaplgia in this study. In a registry study performed by (Nasef and Abdel Rahman, 2017) in Kafrelsheikh city, Kafrelsheikh governorate, level IV has the highest frequency followed by level V then level III. (Altonoby *et al.,* 2017) recorded level IV was the highest percentage in Tanta city, Egypt. Viking speech scale was preformed for children aged between 4 to 18 years**,** the results showed that level II of speech ability has the highest prevalence which may be due to most cases were spastic diplegic CP. (Mostafa *et al.,* 2017) recorded level IV was the highest percentage in Sohag city, Egypt and (Australian Cerebral Palsy Register, 2016) recorded level III was the highest percentage in Tanta city, Egypt. The results showed a significant correlation between the onset of CP and parent consanguinity (P=0.03) and delivery intervention (P=0.05). Results also showed a high significant correlation between the onset of CP and complications during pregnancy (P= 0.001) as well as birth weight (P=0.001). Therefore, consanguinity, delivery intervention, complications during pregnancy and birth weight could be a predisposing factor for CP. Most studies about prevalence of CP in low-income countries report prevalence's greater than 2/1,000 children, while prevalence estimates from industrialized countries are consistently below developing countries. Major risk factors in some low-income countries include specific genetic diseases, a higher frequency of births to older mothers, consanguinity, specific micronutrient deficiencies and infections, but their contributions to the etiology of developmental disabilities in low-income countries are not well documented. Though many of the causes of developmental disabilities are understood and preventable, proven methods of prevention are not being fully implemented in developing countries. Epidemiologic studies are needed to raise awareness of the public health impacts of developmental disabilities in low-income countries and to provide a basis for setting priorities and designing efficient intervene.

Conclusion

The current study revealed that the total CP cases who are referred to physical therapy services in Port Said Governorate, Egypt were 120 cases representing 3/10000 live birth from the age of 1month to 18 years. Consanguinity, delivery intervention, complications during pregnancy andbirth weight have an important effect of the prevalence of CP within the participated children. This study has great importance aiming to establish a data base about CP. This may help to improve health services, awareness about CP and establish a prevalence about CP in Port Said. It is not only counting cases but also using Australian Registry Form as a way of assessment by GMFCS and MACS. This study is limited to Port Said Governorate, therefore, studies are required to investigate the prevalence of CP in other governorates in Egypt.

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