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Establish Registry of Cerebral Palsy in Alexandria (Wassat District) Egypt

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Abstract

Background: *Cerebral palsy is a common neurological disorders that requires a comprehensive assessment as well as treatment. There is shortage of data concerning the prevalence of cerebral palsy among Egyptian children.*

Aim: *To establish registry of cerebral palsy in Alexandria (Wassat District) Egypt.*

Subjects: *147 children with cerebral palsy of both genders, age ranged from 6 months to 18 years participated in this study. They were selected from hospitals and private centers in Alexandria (Wassat District).*

Methods*: Gross motor function classification system, manual ability classification system and Viking scale were used for assessment.*

Results: *Boys represented 61.2%. Preterm delivery represented the highest frequency, with percentage of 60.54%, while very low birth weight represented by 76.9%. Spastic cerebral palsy was the most common type representing 82.34%. Moreover, spastic hemiplegic type represented 37.4%. Finally, gross and fine motor impairments were recorded according to gross motor function classification system, manual ability classification system and Viking scale.*

Conclusion*: Based on the results it could be concluded that, spastic type has the highest frequency among cases and male population are more affected. Finally, children with cerebral palsy show variable degrees of gross and fine motor impairments.*

Keywords: *Cerebral palsy, Registry, Alexandria, Physical therapy.*

I. Introduction

Patient registry is an organized document system to collect uniformed data that evaluate specified outcomes for population defined by particular disease that serves a predetermined scientific, clinical or policy purposes. Significant knowledge regarding the prevalence, cause, distribution, frequency, and severity of cerebral palsy (CP) has been elucidated by CP registries. It has been established in Europe and Australia for more than 30 years [1]**.** It can contribute to monitor the incidence and prevalence of CP and to know more about the etiologies of CP and its management. CP registers vary in relation to their primary purpose, methodology and funding. CP registers consist of a list of names or other unique identifiers of persons meeting pre-defined criteria for CP with varying quantities of data appended to the identifier of each registrant. [2,3]

Cerebral palsy is a lifelong disorder that occurs in the developing fetal or immature infant brain. It is one of the major causes of physical disability in childhood. It is a syndrome that primarily involves impaired control of movement which is often accompanied by disturbances of cognition and psychosocial problems The reported incidence and prevalence of CP is approximately 1.5–3 per 1,000**.** [4,5] CP is classified according motor impairment of the limbs in to three types: spastic, ataxic, and athetoid. Also there is a mixed type that shows a combination of features of the other three types**.** [6] Clinically, spastic subtype is classified according to the topographic distribution of muscle spasticity. This method classifies children as diplegic (bilateral involvement with leg involvement greater than arm involvement), hemiplegic (unilateral involvement), or quadriplegic (bilateral involvement with arm involvement equal to or greater than leg involvement. [7,8]

Athetoid or dyskinetic CP is primarily associated with damage to the basal ganglia during brain development due to bilirubin encephalopathy and hypoxic ischemic brain injury**.** [9]

Ataxic CP the least frequent form of CP. It is clinically observed in 5-10% of all cases of CP . Ataxic CP is caused by damage to cerebellar structures. Children with ataxic CP experience problems in coordination, specifically in their arms, legs, and trunk. [10]

The possible causes of CP include problems in intrauterine development as exposure to radiation, hypoxia of the brain, trauma occurred during labor and delivery, and post neonatal factors such as head trauma or cerebral infections. [11,12]

The current study was conducted to establish registry of cerebral palsy in Alexandria (Wassat District) Egypt

Methods

Subjects

Data were collected based on child assessment and children's reports with CP receiving physical therapy in Alexandria hospitals, health insurance hospitals and private physical therapy centers (Wassat district). A hundred and forty-seven children with CP participated in this study. Approval from mangers of hospitals and private centers as well as a written consent form from children's parents were obtained before starting the study.

Inclusion criteria:

The current study was conducted from February to August 2016. All target population of the study were diagnosed as spastic CP "hemiplegic, monoplegic, triplegic and quadriplegic", dyskinetic, ataxia and hypotonia CP. Their age ranged from 6 months to 18 years old from both genders.

Exclusive criteria:

Children were excluded from the study if they were older than 18 years old, had diagnosis other than CP genetic disorders, metabolic disorders and brain tumors or from outside Alexandria (Wassat District).

Methods

1- **Gross Motor Function Classification System (GMFCS)**: It is arranged into five formative measurements frequently with children with CP to characterize the motor involvement of children with CP on the basis of their functional and walking abilities and their need for assistive technology and wheeled mobility according to chronological age. This test classifies children as; Level I: "Walks without limitations"; Level II: "walks with limitations"; Level III: "Walks using a hand-held mobility device"; Level IV: "Self-mobility with limitations", can use motorized mobility; and Level V: "Transported in a manual wheelchair". [13]

2- **Manual Ability Classification System (MACS)**: It is a tool used to assess the manual ability of children between 4 and 18 years of age. It classifies children as "Level I - handles objects easily and successfully; Level II - handles most objects but with somewhat reduced quality and/or speed of achievement; Level III - handles objects with difficulty, needs help to prepare and/or modify activities; Level IV - handles a limited selection of easily managed objects in adapted situations; Level V - does not handle objects and has severely limited ability to perform even simple actions"**.** [14]

3- **Viking speech scale:** This scale has been developed to classify children's speech production. It is developed for use with children aged 4 years and above. 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: No understandable speech. [15]

Procedure:

Child demographic data were recorded from the patient file and parents interview including name, gender, chronological age, date of birth and address. Information about the birth history was also collected such as, birth weight and gestational age. Information regarding maternal history included the type of labor, multiple births, mother's medical condition, and cause of CP. In addition, the clinical details of children with CP such as type and severity of CP were determined by GMFCS, MACS and Viking scale results.

II. Results

Study area: Alexandria Governorate is located in the northern part of the country, directly on the Mediterranean Sea. The total area size of Alexandria governorate is almost 2818 km^2. It's population is more than four and half million (4,799,740) in March 2015) and population density of 1700 square kilometers according to the central agency for public mobilization and statistic. It is divided into six districts. This study was conducted in Wassat district (520,450).

The frequency distribution; number (N) and percentage (%) of demographic and birth history data were demonstrated in table (1). From total population sample boys were 90 representing 61.2% with boys/girls ratio was 1.58/1. Preterm delivery represented the highest frequency with percentage of 60.54%. Moreover, children who were born with very low birth weight were 113 representing 76.9% of total sample.

Table (1): Frequency distribution and percentage by demographic data and birth history:

Variable		Number	Percentage
Gender	**Boys**	90	61.2
	Girls	57	38.8
	Total	147	100
Gestational age	**Full term**	55	37.4
	Pre term	89	60.54
	Unknown	3	2.05
	Total	147	100
Birth weight	**Very low**	113	76.9
	Low	29	19.7
	Normal	5	3.4
	Total	147	100

The results also revealed that, 31.3% of births were normally delivered, while multiple births represented 5.4%. Mothers who had a history of chronic diseases as obesity, diabetes, maternal inflammatory conditions, miscarriage were only 28 representing 19%. From total sample, 23.81% had a pre/perinatal confirmed causes of CP as demonstrated in table (2).

Table (2): Frequency distribution and percentage according to maternal history:

Variable		Number	Percentage (%)
Type of delivery	**Normal**	46	31.3
Multiple birth	**Yes**	8	5.4
Medical condition	**Chronic illness**	28	19
Causes of CP	**Pre/perinatal**	35	23.81
	Postnatal	69	46.94
	Unknown	43	29.25
	Total	**147**	**100**

Spastic CP showed the highest frequency in 121 representing 82.34%. While, spastic hemiplegic CP showed the highest frequency in 55 cases representing 37.4%, diaplegic type representing 36.1%, while quadriplegic type representing 8.5%. According to GMFCS, 94 were on level I and II representing the higher frequencies with percentage 63.94%. (Table 3).

Table (3): Level of impairments according to GMFCS

CP type / GMFCS	SD		SH		SQ		DK		AT		Total	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Level I	17	11.6	25	17	-	-	-	-	3	2	45	30.6
Level II	22	15	20	13.6	-	-	-	-	7	4.8	49	33.3
Level III	10	6.8	9	6.1	2	1.4	1	0.7	2	1.4	24	16.31
Level IV	4	2.7	1	0.7	6	4	7	4.8	-	-	18	12.2
Level V	-	-	-	-	5	3.4	6	4	-	-	11	7.5
Total	53	36.1	55	37.4	13	8.8	14	9.5	12	8.2	147	100

SD	Spastic diplegia	SH	Spastic hemeplegia	SQ	Spastic quadilpegia	DK	Dyskinesia
AT	Ataxia	N	Number	%	Percentage		

Children who were legible for assessment on MACS and Viking scale (> 4 years) were 54 children. According to MACS, 27 children were on level I and II representing 50%, while 32 were on level III and IV representing 59.25% on Viking scale, as demonstrated in table (4,5).

Table (4): Level of impairments according to MACS.

CP type / MACS	SD		SH		SQ		DK		AT		Total	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Level I	6	11.1	6	11.1	-	-	-	-	3	5.6	15	27.77
Level II	5	9.3	3	5.6	-	-	-	-	4	7.3	12	22.22
Level III	3	5.6	2	3.7	2	3.7	1	1.9	2	1.9	10	18.51
Level IV	-	-	-	-	4	7.3	6	11.1	-	-	10	18.51
LV	-	-	-	-	3	5.6	4	7.3	-	-	7	13
Total	14	26	11	20.3	9	16.66	11	20.4	9	16.66	54	100

SD	Spastic diplegia	SH	Spastic hemeplegia	SQ	Spastic quadilpegia	DK	Dyskinesia
AT	Ataxia	N	Number	%	Percentage		

CP type / Viking	SD		SH		SQ		DK		AT		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
LI	4	7.5	4	7.5	-	-	-	-	2	3.7	10	18
LII	9	16.7	6	11.1	1	1.8	-	-	6	11.1	22	40.7
LIII	1	1.8	1	1.8	6	11.1	3	5.5	1	1.8	12	23.2
LIV	-	-	-	-	2	3.7	8	14.8	-	-	10	18
Total	14	26	11	20.4	9	16.6	11	20.3	9	16.6	54	100

SD	Spastic diplegia	SH	Spastic hemeplegia	SQ	Spastic quadilpegia	DK	Dyskinesia
AT	Ataxia	N	Number	%	Percentage		

III. Discussion

The collected data revealed that, CP affects both genders. However, boys were affected more than girls with percentage 61.2% and boys/girls ratio was 1.57/1. This is consistent with the results of **Johnson**, [16] who reported that boy/girl ratio in Europe is 1.33/1, while in India the boy/girl ratio is 1.9/1.

Regarding the gestational age, preterm delivery represented the highest frequency with percentage 60.54%. This matched the opinion of **Australian Cerebral Palsy Register Group**[17]**; Wu,** [18] who found that, preterm birth is considered as a major risk factor for CP, with over 40% of individuals being born preterm.

The results also comes in agreement with **Oskoui et al.,** [19] who reported that, CP is commonly reported in children who were born before 28 weeks of gestation**.** Similarly, **Cans et al.,** [20] concluded that, the prevalence of CP decreases significantly with increasing gestational age category: 14.6% at 22–27 weeks' gestation, 6.2% at 28–31 weeks, 0.7% at 32– 36 weeks, and 0.1% in term infants.

Children born with very low birth weight represented 76.9%. It comes in agreement with **Platt et al.,** [21]**; Cans et al.,** [20] who reported that, the highest prevalence of CP is among children whose birth weight from 1000 to 1499 grams (g) while the lowest prevalence is in children who were born over 2500g.

The results of the current study showed that, 5.4% were born in multiple births. It comes in agreement with **Kulkarni et al.,** [22] who reported that, by 2011, 36% of twin births and 78% of triplet and higher-order births resulted from conception by assisted reproductive technology. Similarly, **Alexander et al.,** [23] stated that, babies born from multiple-birth pregnancies are much more likely to result in premature birth than those from single pregnancies. 51% of twins and 91% of triplets are born preterm, compared to 9.4% in singletons.14% of twins and 41% of triplets are even born very preterm, compared to 1.7% in singletons.

The results showed that, 19 % of mothers had a history of chronic diseases as obesity, diabetes, maternal inflammatory conditions, miscarriage, which are considered as risk factor for CP. These findings come in agreement with **Stothard et al.,** [24]**; Locatelli et al.,** [25] who reported that, obesity is associated with adverse outcomes in both mother and child, including gestational diabetes, preeclampsia, increased rates of birth defects and neonatal encephalopathy. Similarly, **Shatrov et al.,** [26] who stated that, obesity induces a chronic inflammatory state, and maternal inflammatory conditions such as chorioamnionitis are known to contribute to CP.

Thorp et al., [27]**; Rooney et al.,** [28] reported that, recurrent previous abortion or miscarriage is considered to be a risk factor for CP and may increase the risk of preterm birth. **Mann et al.,** [29] who found that, there is excess risk of CP in children from preeclampsia diagnosed before 37 weeks of gestation.

The results of the current study revealed that, 23.81% of CP cases were due to brain injury occurred during pre/perinatal periods, during pregnancy and up to first 28 days.

These findings come in agreement with **Ellenberg and Nelson** [30] **; MacLennan et al.,** [31] who reported that, possible risk factors for CP are common in preterm- and term-born children. Similarly, **Australian Cerebral Palsy Register Group,** [17] reported that, approximately 94% of individuals with CP, the brain injury is believed to have been acquired during the antenatal or the neonatal period of infant development, that is, during pregnancy, or within the first 28 days of life.

The results showed that, spastic CP was the most common type representing 82.34% of total sample, while dyskinetic type was 9.5% and ataxic type representing 8.2%. These findings come in agreement with **Rosenbaum et al.,** [32]**; Blair,** [33]; **Parkinson et al.,** [34] who stated that, spastic CP is the most common type of CP. Spasticity is the predominant type of CP, occurring in 77% to 93% of CP cases, dyskinesia in 2% to 15%, and ataxia in 2% to 8%.

Moreover, hemiplegic type showed the highest frequency representing 37.4%. **Cioni et al.,** [35] confirmed our results as they stated that, hemiplegic forms, constitute the most frequent expression of CP more than 38% of cases while diplegia representing 20% of cases.

The results also come in disagreement with **Ashwal et al,** [36]; **Tong-Wai et al.,** [37] **who** reported that**,** spastic diplegia is one of the most common clinical subtypes of CP regardless of birth weight and gestation. It accounts for about 44% of the total incidence of CP. It is the principal of CP in preterm infants, representing 80% of preterm infants and 18% of the overall CP population.

The results showed that, children with CP experience variable degrees of gross and fine motor impairments which may be attributed to spasticity, muscle weakness, and increased joint stiffness.

According to GMFCS, 94 were on level I and II representing the higher frequencies with percentage 63.94%. This comes in accordance with **Nordmark et al.,** [38] who reported that, most of CP children are at level I to III on GMFCS. This also comes in agreement with **Beckung et al.,** [39] who reported that, over 60% of children with CP could walk without assistive walking devices (GMFCS levels I–II).

This matches the opinion of **Lin,** [40] **who** stated that, children with CP experience varying degrees of limitations in their motor skills. Disordered motor performance might be due do (1) delayed motor development and weakness, (2) impaired movement sequencing, dexterity, anticipatory control, (3) inappropriate posture and associated postures, (4) bone and joint deformities as the child grow.

Similarly**, Gormley,** [41] reported that, children with CP have many neurological deficits that interfere with motor function and daily activities. These impairments include neuromuscular and musculoskeletal problems such as spasticity, muscle contractures, un-coordination, loss of selective motor control, and weakness.

Regarding manual abilities, 27 children were on level I and II representing 50%, while 25 were at level III, IV and V representing 46.29% which indicated that, children with CP children experience impairments in manual abilities. This comes in agreement with **Flett,** [42] who stated that, children with CP demonstrate poor hand function due to spasticity in the wrist and finger flexors. Similarly, **Scheker et al.,** [43] reported that, spasticity in the flexor muscles of the upper limbs poses a great deal of functional limitation in the hands. One common problem associated with poor hand function as a result of spasticity is the inability of the child manipulate objects and difficulty with fine motor tasks such as writing or cutting with hands.

According to Viking scale,32 ere on level III and IV representing 59.25%. These findings are supported by **Park et al.,** [4] who concluded that, communication difficulties can be associated with any type of CP and may relate to limitations in the production of movements for speech, gesture and facial expression; receptive or expressive language; hearing; vision; or a combination of limitations in these functions. Speech impairments are estimated to affect approximately 36% of children with cerebral palsy and communication difficulties are observed in around 42%.

IV. Conclusion

The present study concluded that; boys are more affected with CP. Prematurity, very low birth weight, multiple births and chronic illness increase the risk of CP. Spastic CP is the most common type. Moreover, spastic hemiplegic CP represents the highest frequency among cases. Finally, children with CP experience degrees of gross and fine motor impairments as well as speech disorders.

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Declaration of interest:

The authors declare that there is no conflict of interest in this study. The manuscript has been read and approved by authors.

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