

Relation between Family Socioeconomic Status and Development of Gross Motor Functions in Children with Spastic Cerebral Palsy

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ABSTRACT

Background: The development of gross motor functions is an interaction between both genetic and environmental factors which include family and her socioeconomic status (SES).

Aim of study: To determine the correlation between SES and the development of gross motor functions in children with spastic cerebral palsy. **Subjects and procedures:** Cross sectional study was conducted on fifty three children aged from two to four years. They were diagnosed with spastic cerebral palsy from both sexes. They were classified according to diagnosis by Modified Ashworth Scale into hemiplegia, diplegia and quadriplegia groups. The Egyptian socioeconomic scale was used to detect the level of family socioeconomic status (SES). Gross motor function measure (GMFM 88) were used to evaluate the development of gross motor functions. **Results:** There were strong and moderate positive correlation between family SES and GMFM in children with hemiplegic (p value <0.005), moderate positive correlation in diplegic children (p value <0.005), and weak nonsignificant correlation (p value ≥ 0.05) in children with quadriplegic. **Conclusion:** family SES is related to the gross motor development in children with spastic cerebral palsy according to distribution of spasticity so SES must be considered as a factor affects physical therapy rehabilitation program.

Keywords: Cerebral palsy, spastic, motor development, socioeconomic status.

INTRODUCTION

Cerebral palsy (CP) is a group of disorders affecting the development of movement and posture and causing activity limitation (1). It is attributed to non-progressive disturbances in the developing fetal or infant brain with prevalence rate is approximately 2 / 1,000 live births (2). Children with spastic CP are classified topographically into hemiplegia (20% - 30%), diplegia (30% - 40%), quadriplegia (10% - 15%); and in addition to monoplegia and triplegia which are relatively uncommon (3, 4).

Motor development is a process of change in motor behavior as a result of the interaction of heredity with the environment (5). Child development is composed of several interdependent domains (sensorimotor, cognitive and socio-emotional). It can be influenced by biological factors; gestational age, birth weight, environmental factors (economic status and parents' education) and hereditary factors (6). All these factors can be affected by adverse or favorable situations (6). In this process, it is considered that the environment causes a stimulatory effect that interacts with human biology, producing the motor behavior (5). The socioeconomic status (SES) was related to developmental impairment due to

increase the child's biological vulnerability that accumulates risk factors increases the chances of developmental delay (7-8).

SES is a total measure of a person's work experience, an individual's or family's economic and social position(income, education, and occupation)(9). It was found there is a strong association between SES and health regardless the disease (10).

The relationship between SES and motor development in children with spastic CP is not yet clear, however, it is believed that this association may be subjected to etiological factors and ways for prevention, as well as impairments to motor development (11), so this study was conducted to determine the relation between SES and development of gross motor functions in children of spastic CP.

MATERIALS AND METHODS

The cross sectional study was approved by ethical committee of faculty of physical therapy. It was conducted on children recruited from outpatient clinic of faculty of Physical Therapy Cairo University from April 2019 to December 2019. They had diagnosed as spastic CP, and aged from two to four years. The children with congenital malformation, severe sensory

deficit, chromosomal diseases, botulin toxin injection in the last 3 months, musculoskeletal deformities as scoliosis or hip dysplasia, were excluded from participation in the study. The parents of selected children signed an informed consent before the study.

Measurement procedures:

Modified Ashworth scale is a valid and reliable test for measure muscle tone (12). According to the tone distribution throughout the body the type of spastic CP was determined as diplegia, quadriplegia, or hemiplegia.

Gross motor function measure (GMFM-88) was used to evaluate the development of gross motor functions (13). It is a valid clinical assessment tool, and consists of 88 items in five dimensions A: Lying and Rolling (17 items), B: Sitting (20 items), C: Crawling and Kneeling (14 items), D: Standing (13 items), and E: Walking, Running and Jumping (24 items). Each item was scored as 0 – does not initiate, 1 – initiates, 2 – partially completes, and 3 – completed, or not tested. The GMFM total scores is summation of the scores for all dimensions and dividing by 5. A percentage score ranges from 0 to 100 for total score.

Evaluation of family SES

Egyptian socioeconomic scale was used to assess SES of the child's family and classify it into very low, low, middle and high levels (14) according to its quartiles score. It includes 7 domains with a total score of 84 ; 1- education and cultural domain(for both husband & wife) (score = 30); 2- family domain (score = 10); 3- occupation domain(for both husband & wife) (score = 10); 4- Family possessions domain (score = 12); 5- home sanitation domain (score = 12); 6- health care domain (score = 5); 7- economic domain(score = 5). calculated,

Data analysis:

Descriptive statistics of mean, standard deviation, frequencies were utilized in presenting the subjects demographic data. The GMFM was compared with low and high SES using unpaired t test. Pearson Correlation coefficient value was conducted to investigate the correlation between SES and GMFM. The level of significance for statistical tests was set at $p < 0.05$. All statistical measures were performed through the statistical package for social studies (SPSS) version 25 for windows.

RESULTS

Fifty-three subjects (29 girls and 24 boys) with spastic CP participated in this study. They were

classified according to their tone distribution into hemiplegic (13 children), diplegic (20 children) and quadriplegic (20 children) Table (1).

The median value of SES was 36. Values ≤ 36 were low SES and values > 36 were high SES.

Table (1): Basic characteristics of all participants with spastic CP

factors		Total children (n = 53)	Hemiplegia (n = 13)	Diplegia (n = 20)	Quadriplegia (n = 20)
Age(years)	mean \pm SD	3.22 \pm 0.74	3.37 \pm 0.81	3.11 \pm 0.72	3.24 \pm 0.74
Sex (%)	Girls	29 (54.7%)	5 (38.5%)	13 (65%)	11 (55%)
	Boys	24 (45.3%)	8 (61.5%)	7 (35%)	9 (45%)

SD, standard deviation

Hemiplegic group :

The children with hemiplegia, were 7(54%) children with low SES and 6 (46%) children with high SES. The mean \pm SD of GMFM of hemiplegic children with low SES was 65.88 \pm 11.66% while that of children with high SES was 89.98 \pm 9.26%. There was a significant increase in GMFM of children with high SES compared with that with

low SES (p = 0.002). (table 2, figure 1)

Diplegic group:

Concerning the obtained findings of diplegia, they were 8(40%) children with low SES and 12(60%) children with high SES. The mean \pm SD of GMFM of children with low SES was 52.98 \pm 6.78% while those with high SES was 62.88 \pm 8.01%. There was a significant

increase in GMFM of children with high SES compared with that with low SES ($p = 0.01$). (table 2, figure 1)

Quadriplegic group:

The children with Quadriplegia were 12(60%) children with low SES and 8(40%) children

with high SES. The mean \pm SD of GMFM of quadriplegic children with low SES was $8.03 \pm 5.88\%$ while that of children with high SES was $13.5 \pm 7.71\%$. There was no significant difference in GMFM between children with low and high SES ($p = 0.08$),as shown in table(2),figure(1)

Table (2): Comparison of GMFM between low and high SES in hemiplegia, diplegia and quadriplegia:

SES Type	GMFM in Low SES mean \pm SD	GMFM in High SES mean \pm SD	MD	t value	p value
Hemiplegia	65.88 \pm 11.66	89.98 \pm 9.26	-24.1	-4.07	0.002*
Diplegia	52.98 \pm 6.78	62.88 \pm 8.01	-9.9	-2.87	0.01*
Quadriplegia	8.03 \pm 5.88	13.5 \pm 7.71	-5.47	-1.79	0.08

X: mean; SD: standard deviation; MD: mean difference; p-value: probability value; *, significant

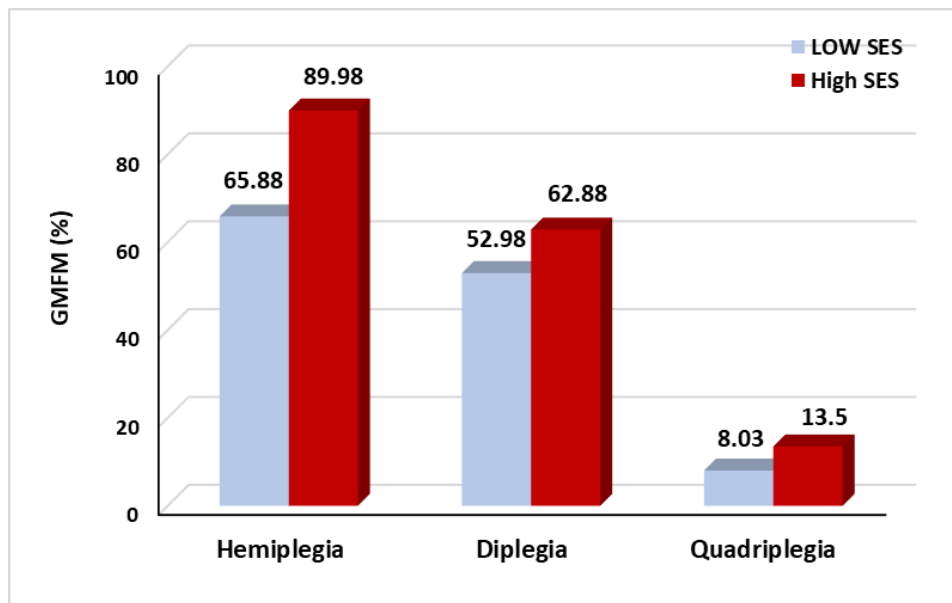


Figure (1): Mean values of GMFM in low and high SES of spastic hemiplegic, diplegic and quadriplegic children

Correlation between SES and GMFM:

There was a strong positive significant correlation between SES and GMFM in children with hemiplegia ($r = 0.84$, $p = 0.001$), table (3) and figure (2). There was a moderate positive significant correlation between SES and GMFM in children with diplegia ($r = 0.58$, $p = 0.007$), table (3) figure (3). There was a weak positive nonsignificant correlation between SES and GMFM in children with quadriplegia ($r = 0.25$, $p = 0.27$), table (3), figure (4)

Table (3): Correlation between SES and GMFM.

	GMFM	r value	p value
SES	Hemiplegia	0.84	0.001**
	Diplegia	0.58	0.007**
	Quadriplegia	0.25	0.27

r value, Pearson Correlation coefficient value; p value, Probability value; **, significant

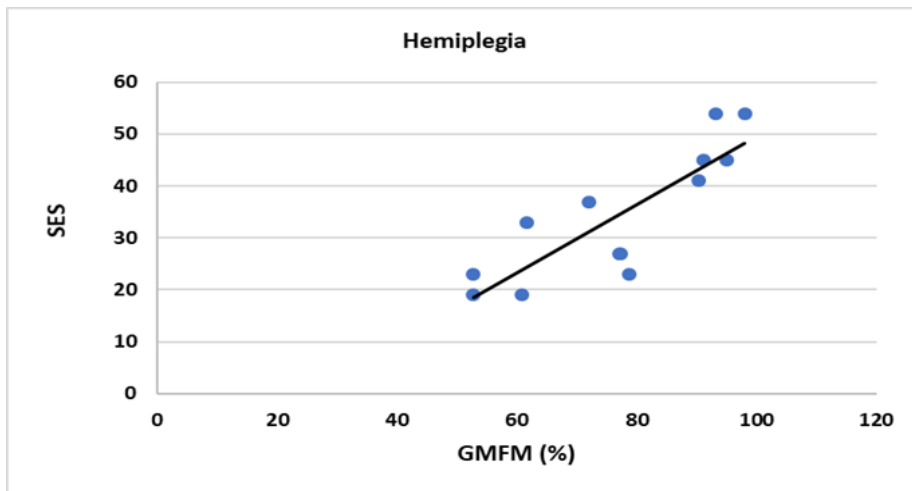


Fig (2): Correlation between GMFM and SES in hemiplegia.

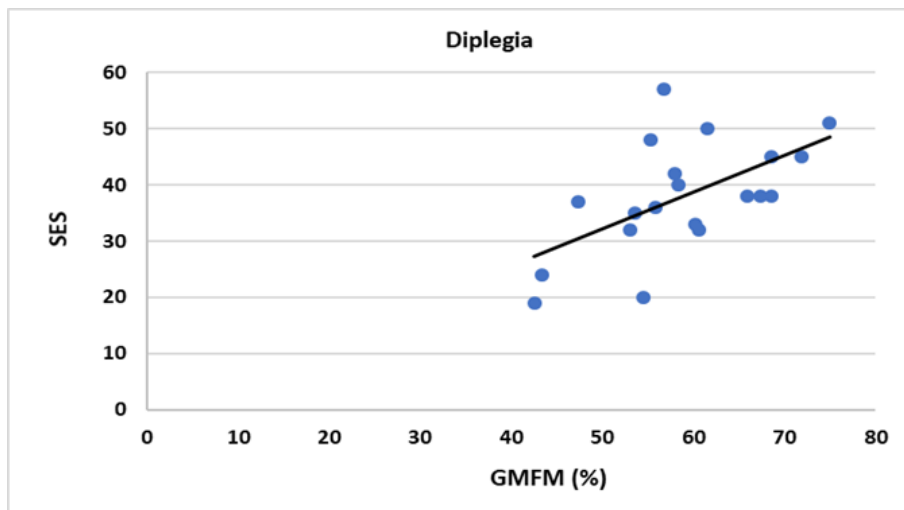


Fig (3): Correlation between GMFM and SES in diplegia.

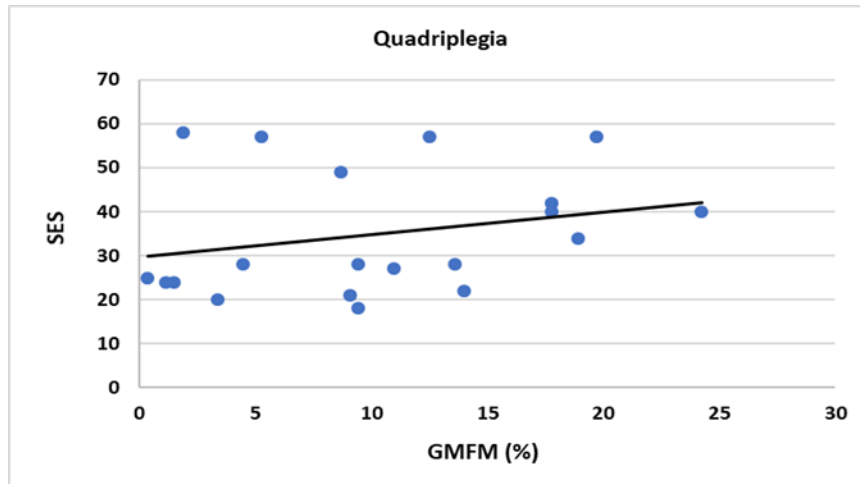


Fig (4): Correlation between GMFM and SES in quadriplegia.

DISCUSSION

The aim of the present study was to evaluate the relation between family SES and motor development in children with spastic CP. The age of these children was selected from birth up to four years because the development is a continuous process and dependent on age as it is rapid in first years of life that was supported by Peter et al., (2002) who reported that younger children have rapid changes in their motor development (15).

Also *Novak I, 2019* reported that every neonates have 100 billion neurons in their brain which ready to exchange thier electrical impulses and create neural pathways, So during first four years of children age , the brain develop rapidly. In the case of brain injury and neurological

disability, early intervention of physical therapy practice specific the skill increase the brain’s ability to adapt or rewire itself, believed that getting access to intervention as early as possible will give a child the best chance of learning, regardless of the condition or diagnosis(16)

Socioeconomic status and GMFM in the current study revealed that there were Strong positive significant correlation in hemiplegic cases($r = 0.84$, $p = 0.001$), moderate positive significant correlation in diaplegic cases; ($r = 0.58$, $p = 0.007$), and weak positive non-significant correlation in quadriplegic cases ($r = 0.25$, $p = 0.27$) (table 3, figure 2, 3,4). These results were agreed with Mancini et al (17) who mentioned that “the high SES of families is related to certain favorable conditions, such as greater parental

education, greater access to information, and greater purchasing power.” With the increase in family income, parents become more able to pay attention and invest in their children, following the guidance of health and education professionals. Andrade et al(18)reported that in the process of rehabilitation of the child, the SES of the family may be a barrier or a facilitator, i.e., in this process of acquisitions of new skills this may be a deciding factor.Bracco et al(19), the low SES may cause an inactive behavior of children, related to restricted alternatives for leisure and culture. While Dowding and Barry(20) found that the social class affected the most severe cases of CP which disagree with current results,

In conclusion, socioeconomic status influence the motor development of children with spastic cerebral palsy so It must be considered as an important factor in physical therapy rehabilitation program

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