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A Study to Find Out the Correlation between the Lateral Flared Out Position of the Rib Cage and the Age of Cerebral Palsy Children

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ABSTRACT

INTRODUCTION: Cerebral palsy (CP) describes a group of permanent disorders of the development of movement and posture, causing activity limitation, that are attributed to non-progressive disturbances that occurred in the developing fetal or infant brain. The motor disorder of cerebral palsy is often accompanied by disturbances of sensation, perception, cognition, communication, and behaviour by epilepsy, and by secondary musculoskeletal problems

OBJECTIVE: Study to find out the correlation between the lateral flared out position of the rib cage and the age of cerebral palsy children.

DESIGN: A descriptive correlation study design

SETTING: Occupational Therapy department, Swami Vivekanand National Institute of Rehabilitation Training and Research, Olatpur, Odisha, 754010

PARTICIPANTS: A group of 100 children aged between 6 month and 10 year with the diagnosis of cerebral palsy were included in this study

INTERVENTION: 100 subjects were selected for the study. Chest width of all subjects were measured by using sliding caliper at 10th rib and nipple level, as well as the difference between these two levels were measured. The difference of chest width was taken for data analysis. All the children were categorized based on the topographical classification and the correlation was formed out in each category of cerebral palsy children.

DEPENDENT VARIABLE: chest width difference at the nipple level and 10th rib level

INSTRUMENT USED: Sliding caliper was used in this study as sliding caliper is considered as a more objective method for measuring chest width. (Meredith, knott,1937)

RESULT: This study has shown that similarities and difference exist in chest width difference at the nipple level and 10th rib level with age and type of cerebral palsy children.In this study, the correlation between age of cerebral palsy children and chest width difference at the nipple level and 10th rib level, there was moderate correlation (r = .407) between them.

CONCLUSION: The result of this study suggest that the lateral flared out position of rib cage is highly prevalent in quadriplegic type of cerebral palsy than other sub groups (diplegic and hemiplegic) It is concluded that early intervention in maintaining proper positing enhances co contraction, not only does it increase functional abilities but also limits the lateral flared out position of rib cage which can increase lung function.

KEYWORDS: *Cerebral palsy, diaphragmatic, intercoastal muscle, STCP, Centre of mass, perception, cognition*

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INTRODUCTION

Disabled children are of great concern to a family as well as to the society. When disability is discussed, particularly in children, about a quarter of chronic childhood problems are neurological in origin. Cerebral palsy (CP) is the leading cause of chronic disability in children, making them physically and mentally handicapped and socially aloof.[1]

Cerebral palsy (CP) describes a group of permanent disorders of the development of movement and posture, causing activity limitation, that are attributed to non-progressive disturbances that occurred in the developing fetal or infant brain. The motor disorder of cerebral palsy is often accompanied by disturbances of sensation, perception, cognition, communication, and behaviour by epilepsy, and by secondary musculoskeletal problems.[2]

According to World Health Organization (WHO) estimation, 10% of the global population has some form of disability due to different causes; in India, it is 3.8% of the population. Nearly 15-20% of the total physically handicapped children suffer from Cerebral Palsy (CP). For India, the estimated incidence is around 3/1000 live births; however, being a developing country, the expected actual figure may be much higher.[3]

The new born is totally flexed in utero, presents at birth with a very tight Respiratory accessory muscles of anterior chest, yet that have not developed significantly to move the chest wall, as a result the new born is diaphragmatic nose breather. As the normal child development progresses, at the age of 6 month not only the child starts to move free into and out of gravity's resistance at will, also the upright posture allows gravity to pull and rotate the rib downward as a result the chest shape becomes elliptical in a sagittal plane along with the development of ventilatory musclegroups (the diaphragm, the abdominal muscle and the intercoastal muscle). After 12 months the shape of the chest is clearly rectangular in the anterior plane.[4]

Children with a different trunk muscle dysfunction from cerebral palsy, can present a different thoracic abnormality. Those who demonstrate weak abdominal muscles, but have the ability to laterally expand the lower chest wall, may develop a lateral flaring of the rib cage. if they are positioned much of the time in supine, the lower border of their rib cage is likely to flare out laterally because this motion is in gravity eliminated plane.[5]

The abdominal muscles consist of the rectus abdominis (RA), internal abdominal oblique (IO), external abdominal oblique (EO), and transverse abdominis (TA). Adjenti, (2017) says that during the active stage, EO and IO muscles in children with STCP (spastic-type cerebral palsy) showed an inability to synchronise the rate of activation of all the already activated motor units. Also, Chapman et al. 2008 concluded that the EO and IO muscles in individuals with STCP (spastic-type cerebral palsy) are likely to be weaker muscles than the RA muscle.

Insufficient abdominal muscle control along with flared out rib cage is the most serious concernfor those who are suffering from cerebral palsy because not only it affects effective secretion clearance, it also[6]affects inter thoracic and inter abdominal pressure which subsequently help in stabilizing the shoulder complex and development of manipulative skills.[7,8] Therefore, the baby may not learn to control his Centre of mass (COM) and might adopt the frog leg position and the rib cage compensates for it.[9] Moreover, in association with respiratory system the restricted rib cage expansion limits the length of sustained phonation and sound /speech production.[10]Therefore, activation of abdominal muscle control and prevention of development of flared out rib cage should be the focus of intervention at an early stage which can prevent secondary developmental problem in cerebral palsy

Though there are many studies which have documented motor problems in relation to age, however, there are no studies which observe prevalence of lateral flared out status of chest width in relation to age of cerebral palsy children.

Therefore, this study was attempted to find out the correlation between the lateral flared out position of the rib cage and the age of cerebral palsy children.

AIMS AND OBJECTIVES

AIM

Study to find out the correlation between the lateral flared out position of the rib cage and the age of cerebral palsy children.

OBJECTIVES

1. To find out chest width difference at the nipple level and 10th rib level.
2. To find out relationship between age and chest width difference at the nipple level and 10th rib level.
3. To compare type of cerebral palsy age and chest width difference at the nipple level and 10th rib level.

ALTERNATE HYPOTHESIS: Degree of lateral flared out position of the rib cage is related to age of cerebral palsy children.

NULL HYPOTHESIS: Degree of lateral flared out position of the rib cage is not related to age of cerebral palsy children.

METHODOLOGY

Study Area: Department of Occupational Therapy, SVNIRTAR

Study design

- A descriptive correlation study design
- Ethical approval and permission to recruit the subject for the study was obtained from the "department of occupational therapy- SVNIRTAR.

Sample size

- Recruitment of the subject were done in paediatric section of occupational therapy department
- All children who complied with the inclusion criteria and whose parents or legal guardian gave written informed consent were invited to participate.
- A group of 100 children aged between 6 month and 10 year with the diagnosis of cerebral palsy were included in this study

Duration of study

March 2018-July 2019

Instrument used

Sliding caliper was used in this study as sliding caliper is considered as a more objective method for measuring chest width. (Meredith, knott, 1937)

Inclusion criteria: -

- 1. Diagnosed with cerebral palsy
- 2. Age 6 month to 10 year.
- 3. Both sexes
- 4. All type of C.P.

Exclusion criteria: -

- Any orthopedic chest and spinal deformity e.g.: scoliosis

Dependent variable: -

- chest width difference at the nipple level and 10th rib level

In-dependent variable: -

- Age and type of cerebral palsy

Procedure

100 subjects were selected for the study. Chest width of all subjects were measured by using sliding caliper at 10th rib and nipple level, as well as the difference between these two levels were measured.

The difference of chest width was taken for data analysis.

All the children were categorized based on the topographical classification and the correlation was formed out in each category of cerebral palsy children

DATA ANALYSIS

Statically analysis

SPSS software package, version 23, was used to analyse the data. Descriptive statics were presented.

Spearman's rank order correlation was calculated between age and chest width difference at the nipple level and 10th rib level in all 100 subjects. The level of significance for all statically test set at $p \geq 0.001$.Spearman's rank order correlation was calculated in three groups of different type of cerebral palsy children.

RESULTS

The analysis of data gives the following tables showing the demographic characteristic.

AGE OF PARTICIPANTS		GENDER OF PARTICIPANTS	
MEAN	3.47	MALE	77
SD	1.954	FEMALE	23

Table 1 SHOWS DEMOGRAPHIC CHARACTERSTIC OF SUBJECT

Out Of the 100 participants with cerebral palsy children. 77 was male 23 was female. The age range was 6 months to 10 year with mean age of 3.47. it consists of 43 quadriplegic, 22 hemiplegic,34 diplegic and 1 triplegic.

	chest width difference at the nipple level and 10th rib level	
	R	p
AGE	.407	.000

Table 2 SHOWS RELATIONSHIP BETWEEN AGE OF SUBJECTS AND CHEST WIDTH DIFFRENCE AT NIPPLE LEVEL AND 10TH RIB LEVEL

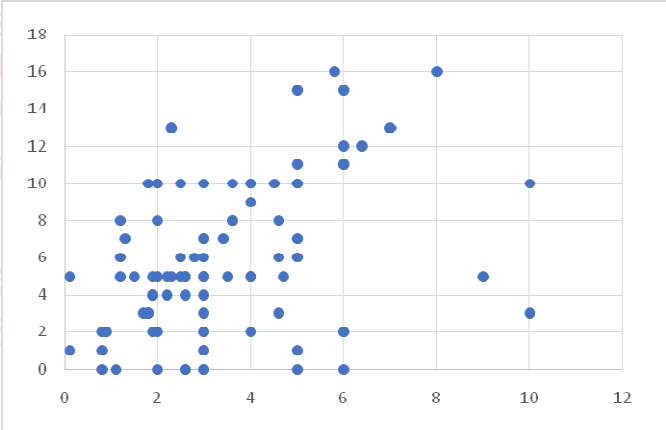

Figure 1 SHOWS RELATIONSHIP BETWEEN AGE OF SUBJECTS AND CHEST WIDTH DIFFRENCE AT NIPPLE LEVEL AND 10TH RIB LEVEL

Relationship between age and chest width difference at the nipple level and 10th rib level was explored and are shown in table 2 & Figure 1. The spearman's correlation result showed that moderate correlation (r =.407) between them.

TYPE OF C.P.	MEAN AGE OF PARTICIPANTS	R	p
QUADRIPLEGIC	3.46	.759	.000
HEMIPLEGIC	2.68	.165	.462
DIPLEGIC	3.98	.039	.848
TRIPLEGIC	NA	NA	NA

Table 3 SHOWS THE RESULTS OF SPEARMAN'S CORRELATION BETWEEN AGE OF DIFFERENT TYPE OF C.P. CHILDREN AND CHEST WIDTH DIFFRENCE AT NIPPLE LEVEL AND 10TH RIB LEVEL

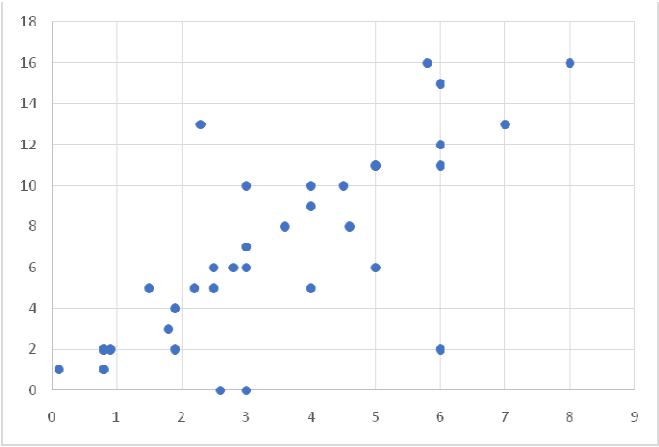

Figure 2 SHOWS RELATIONSHIP BETWEEN AGE OF SUBJECTS AND CHEST WIDTH DIFFRENCE AT NIPPLE LEVEL AND 10TH RIB LEVEL

Relationship between age of different type of cerebral palsy and chest width difference at the nipple level and 10th rib level was explored and are shown in table 3. The spearman's correlation result between age of quadriplegic cerebral palsy and chest width difference at the nipple level and 10th rib level showed that significant correlation (r =.759) between them.

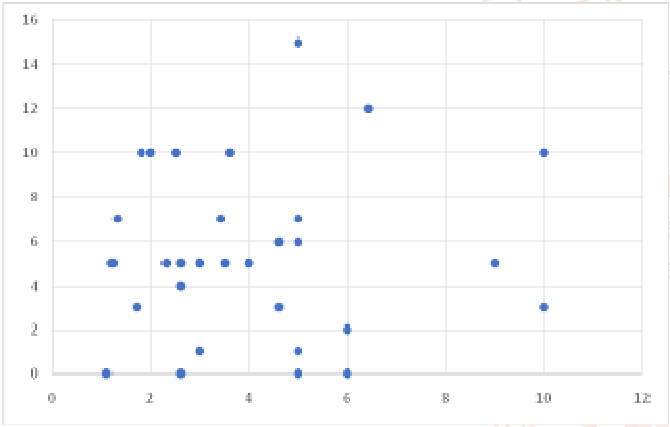

Figure 3 **SHOWS THE RESULTS OF SPEARMAN'S CORRELATION BETWEEN AGE OF DIPLEGIC C.P. CHILDREN AND CHEST WIDTH DIFFRENCE AT NIPPLE LEVEL AND 10TH RIB LEVEL**

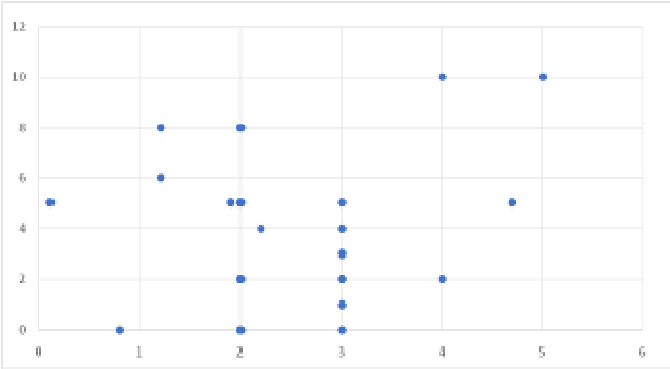

Figure 4 SHOWS RELATIONSHIP BETWEEN AGE OF SUBJECTS AND CHEST WIDTH DIFFRENCE AT NIPPLE LEVEL AND 10TH RIB LEVEL

While no relationship seems to exist for the other two subgroup of cerebral palsy children (i.e. diplegic cerebral palsy and hemiplegic cerebral palsy) with chest width difference at the nipple level and 10th rib level.

DISCUSSION

This study has shown that similarities and difference exist in chest width difference at the nipple level and 10th rib level with age and type of cerebral palsy children.

In this study, the correlation between age of cerebral palsy children and chest width difference at the nipple level and 10th rib level, there was moderate correlation (r = .407) between them.

This result, therefore is in support of conclusion of M. massery (1991) who stated that cerebral palsy children who demonstrate weak abdominal muscle and have limited functional mobility will have more time period in lying position in bed as age increases. Hence chance of flared out position of rib cage increases because this motion is in a gravity eliminated plane.

Also, the result of this study showed that there is significant correlation (r =.759) between the age of quadriplegic cerebral palsy and chest width difference at the nipple level and 10th rib level this result is insupport of study done by Murat Ersoz (2006) who concluded that chest expansion was significantly decreased in all CP subgroups according to type of involvement, although lower chest expansion values were observed in quadriplegia, mental retardation, moderate spasticity and non-ambulatory sub groups. For chest expansion normal function of nervous system, respiratory muscle, costovertebral joint is needed.

As CP does not have articular involvement, the limited chest mobility may be due to impaired neuro-motor control and in co-ordination, weakness, spasticity and secondary changes in respiratory muscle.

Another important finding in this study is to mention there is no correlation(hemiplegic r =.165, diplegic r=.039) between age of subgroup (diplegic cerebral palsy and hemiplegic cerebral palsy) and chest width differenceat the nipple level and 10th rib level. This may be due to less impairment of physical activity in diplegic cerebral palsy and hemiplegic cerebral palsy as compared to quadriplegic cerebral palsy as concluded in the study done by Murat ersoz (2006) on "*decreased chest mobility in children with spastic cerebral palsy. Also,*abdominal muscle weakness may lead to more time in bed positioning.

CONCLUSION

The result of this study suggest that the lateral flared out position of rib cage is highly prevalent in quadriplegic type of cerebral palsy than other sub groups (diplegic and hemiplegic).It is concluded that early intervention in maintaining proper positing enhances co contraction, not only does it increase functional abilities but also limits the lateral flared out position of rib cage which can increase lung function.

REFERENCES

[1] Mockford, M., & Caulton, J. M. (2010). The Pathophysiological Basis of Weakness in Children with Cerebral Palsy. *Pediatric Physical Therapy*, *22*(2), 222–233. https://doi.org/10.1097/PEP.0b013e3181dbaf96

[2] Mrcp, M. R., & Mrcp, M. F. (2000). Prevalence and severity of feeding and nutritional problems in

children with neurological impairment : Oxford Feeding Study, (1986), 674–680.

[3] Mockford, M., & Caulton, J. M. (2010). The Pathophysiological Basis of Weakness in Children with Cerebral Palsy. *Pediatric Physical Therapy*, *22*(2), 222–233. https://doi.org/10.1097/PEP.0b013e3181dbaf96

[4] Mary massery (1991).Chest development as a Component of normal motor development: implications for pediatric physical therapists

[5] Mockford, M., & Caulton, J. M. (2010). The Pathophysiological Basis of Weakness in Children with Cerebral Palsy. *Pediatric Physical Therapy*, *22*(2), 222–233. https://doi.org/10.1097/PEP.0b013e3181dbaf96

[6] Mockford, M., & Caulton, J. M. (2010). The Pathophysiological Basis of Weakness in Children with Cerebral Palsy. *Pediatric Physical Therapy*, *22*(2), 222–233. https://doi.org/10.1097/PEP.0b013e3181dbaf96

[7] Lois Bly,Components of Typical and Atypical Motor Development, Neuro-Developmental Treatment Association, Inc (2011)

[8] Regi Boehme, Approach to Treatment of the Baby,2nd edition, Therapy Skill Builders (June 1, 1990)

[9] Louw, G., Jelsma, J., & Unger, M. (n.d.). An electromyographic study of abdominal muscle activity in children with spastic cerebral palsy, 1–7.

[10] Chapman, A. R., Vicenzino, B., Blanch, P., & Hodges, P. W. (2008). Patterns of leg muscle recruitment vary between novice and highly trained cyclists, *18*, 359–371. https://doi.org/10.1016/j.jelekin.2005.12.007

[11] Mockford, M., & Caulton, J. M. (2010). The Pathophysiological Basis of Weakness in Children with Cerebral Palsy. *Pediatric Physical Therapy*, *22*(2), 222–233. https://doi.org/10.1097/PEP.0b013e3181dbaf96

[12] Donna Frownfelter , Elizabeth Dean,Cardiovascular and Pulmonary Physical Therapy: Evidence to Practice 5th Edition**,** Mosby

[13] Woing, W. (1990). Cerebral Palsy E p idem i o I ogy : Where are We Now and where are We Going ?

[14] Dan, B., & Cheron, G. (2004). Reconstructing cerebral palsy, *2*(2), 57–64.

[15] Rothman, J. G. (2018). Effects of Respiratory Exercises on the Vital Capacity and Forced Expiratory Volume in Children with Cerebral Palsy, *i*(4), 421–425.

[16] Hodges, P. W., Heijnen, I., & Gandevia, S. C. (2001). P ostural activity of the diaphragm is reduced in humans when respiratory demand increases, 999–1008.

[17] Mrcp, M. R., & Mrcp, M. F. (2000). Prevalence and severity of feeding and nutritional problems in children with neurological impairment : Oxford Feeding Study, (1986), 674–680.

[18] Health, C., & Children, T. (1992). Gastrooesophageal reflux in children with cerebral palsy.

[19] Hardy, J. C. (1964). Lung Function of Athetoid and Spastic Quadriplegic Children, 378–388.

[20] Park, E. S., Park, J. H., Rha, D., Park, C. Il, & Park, C. W. (2006). Comparison of the Ratio of Upper to Lower Chest Wall in Children with Spastic Quadriplegic Cerebral Palsy and Normally Developed Children, *47*(2), 237–242.

[21] Ersöz, M., Selçuk, B., Gündüz, R., Kurtaran, A., & Akyüz, M. (2006). Decreased chest mobility in children with spastic cerebral palsy, 344–350.