

Peak Expiratory Flow Rate In Children with Multiple Neurological Disorder

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A neurological disorder is a structural, biochemical or electrical abnormalities in the brain or spinal cord and peripheral nerves. Neurological disorders include mental retardation, cerebralpalsy, autism and down' syndrome. Children with neurological disorders have a high incidence of respiratory problems. Many children with cerebral palsy have scoliosis, an irregular curvature of spine that can interfere with lungs ability to expand. Genetic condition including cerebral palsy and muscular dystrophy can be associated with congenital airway abnormalities. The aim of the study is to find out peak expiratory flow rate in children with multiple neurological disorder. Study design non-experimental,15 subjects with age group of 7-17years was selected based on the inclusion and exclusion criteria.(subjects:3-cerebral palsy,3-down syndrome,2-autism,7-mental retardation) were selected Maithree special school, East Tambaram. An informed consent was obtained from the parents and children with detailed explanation of the procedure. First the participant was asked to breath in and breath out normally and then breath in deeply as much as possible followed by quick expiration to the maximum into the device. Three trials have been done and best of the three is adopted as PEFr. The value on the meter was monitored and recorded. The training was stopped whenever the subject feels dizziness. Results: The data on height, age, sex, weight, were registered. The peak expiratory flow rate of normal children ranges from 182-565 l/min.The mean value of PEFr in children with multiple neurological disorder was found to be cerebral palsy-121 l/ min, Down's syndrome-130 l/min, autism-77.5 l/min, mentally retarded-145 l/min. For the data, complete action of PEFr measurement were performed in children with multiple neurological disorder. The PEFr values clearly depicts that the children with multiple neurological disorder have decreased PEFr. Our findings confirm that the peak expiratory flow meter is a well functioning instrument for measuring PEFr in children, giving reliable results, and an inexpensive tool. Conclusion: The study conclude that there was a decreased PEFr in children with cerebral palsy, down's syndrome, autism and mentally retarded. The study was made simple and this can be done by giving interventions like respiratory muscle training .

Keywords: Peak expiratory flow meter, peak expiratory flow rate, Cerebral palsy, mental retardation, Down syndrome. Autism.

A neurological disorder is a structural, biochemical or electrical abnormalities in the brain or spinal cord and peripheral¹. Neurological disorders include autism, learning disabilities,

mental retardation, cerebral palsy, and impairments in vision and hearing. Children with neurological disorders can experience difficulties with motor function, behaviour, memory, learning, language

and speech². The cause behind these neurological conditions may involve genetic involvement or any trauma during pre natal, natal, post natal periods and environmental contaminants³.The estimated prevalence of neurological disorders is nearly 1 in 8 among children in India. The studies also inference that children with severe neurological disorders have a high incidence of respiratory difficulties which is multi factorial^{4,5,6}.Pathology-Those include neural connection to the respiratory system, structural abnormality like scoliosis, obstructive sleep apnea, respiratory tract infections due to decreased immune response and difficulty in clearing lung secretions¹⁹.

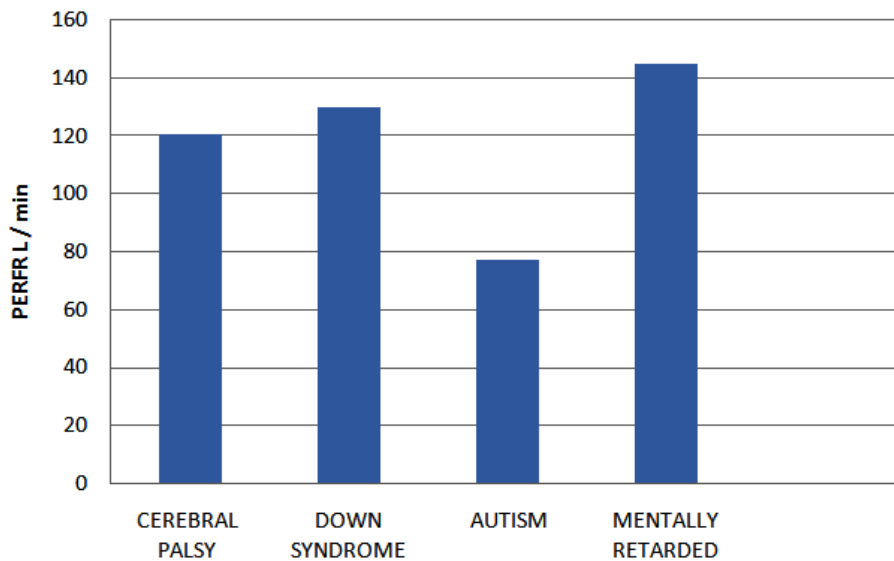
Many children with cerebral palsy have scoliosis, an irregular curvature of the spine that can interfere with lungs ability to expand. Genetic condition including cerebral palsy, muscular dystrophy and familial dysautonomia can be associated with congenital airway abnormalities.^{7,8,9} They can affect any part of a child’s airway, including the nasal cavity, the mouth and tongue, the oesophagus, the tube that carries food to the stomach; the larynx, or voice box; the trachea, or windpipe; and the lungs. Peak expiratory flow rate could be a factor that analyse the respiratory difficulties in neurological disorder patients^{10,11,12}. The objective of the study is to find out the peak expiratory flow rate in children with cerebral palsy, Down’s syndrome, autism and mentally retarded.

METHODOLOGY

Study design non-experimental,13 subjects with age group of 7-17years was selected based on the inclusion and exclusion criteria. (subjects:3-cerebral palsy,3-down syndrome,2-autism,5-mental retardation). An informed consent was obtained from the parents and children with detailed explanation of the procedure. First the participant was made to sit in a comfortable position and was asked to breath in and breath out normally and then breath in deeply as much as possible followed by quick expiration to the maximum into the peak expiratory flow meter. Three trials have been done and best of the three is adopted as PEFR. The value on the meter is monitored and recorded. The training was stopped whenever the subject feels dizziness .

Table 1.

Neurological conditions	No of samples	Mean PEFR (l/min)
Cerebral Palsy	3	121
Down syndrome	3	130
Autism	2	77.5
Mentally retarded	7	145



Graph 1.

RESULTS

The table-1 depicts about the peak expiratory flow rate of the children with cerebral palsy, down's syndrome, autism and mentally retarded

The graph-1 shows the PEFR of children with cerebral palsy, down's syndrome, autism and mentally retarded.

This graph shows the peak expiratory flow rate of the children with multiple neurological disorder. 15 children with previous episodes of lung infection, the data on height, age, sex, weight, were registered. The peak expiratory flow rate of normal children ranges from 182-565 l/min. The mean value of PEFR in children with multiple neurological disorder was found to be: cerebral palsy-121 l/min, Down's syndrome-130 l/min, autism-77.5 l/min, mentally retarded-145 l/min. For the data, complete action of PEFR measurement were performed in children with multiple neurological disorder. The PEFR values clearly depicts that the children with multiple neurological disorder have decreased PEFR.

DISCUSSION

The importance of peak expiratory flow among the neurologically impaired children is a variable of respiratory muscle function. Respiratory muscle dysfunction is a cause for morbidity and mortality among neurologically disabled children, because of uneffective cough produced. Patients with neurological disorder, can be associated for expiration by thoraco abdominal thrust.

A study previously done by A. Hort *et al.* on peak expiratory flow rate in healthy children of age 6-17 concluded that the peak expiratory flow (PEFR) is higher in boys than girls and increase with height, comparatively PEFR is less among smaller age group and increase with age.^{13,14,15}

Another study on peak expiratory flow rate in school, that as the early detection of airway obstruction in a symptomatic state. Early detection of children could have early intervention and improve quality of life.

In peak expiratory flow, three flow manoeuvres take place, each manoeuvre requires different respiratory muscle with glottis closure. The greater transpulmonary pressure is created

by coughing rather than by peak expiratory flow results in 88.2% in patients and 78.9% of normal subjects.

Howard B Punitch MD 2017 concluded that Several factors contribute to respiratory difficulties in neurological disorder includes, poor coordination of muscle in cerebral palsy. Immune problem in Down's syndrome. Clinical problem includes recurrent chest infection, persistent cough, airway obstruction, obstructive sleep apnea, respiratory failure with minor respiratory infections are common among neurologically impaired children. Intercostals muscles are affected, causes paradoxical breathing and progress to diaphragm weakness and onset of respiratory failure.^{16,17,18}

The peak expiratory flow rate (PEFR) of normal children ranges from 182-565 l/min. There is a decreased PEFR among neurologically impaired children is a well known fact, but among the neurologically affected patient there is a decrease in PEFR among spastic diplegic whereas down syndrome accounts for higher PEFR. The underlying pathology and contributing factors could influence the PEFR.

Yong Hyun Kwon *et al.* In spastic diplegia concluded that there is a motor dysfunction with abnormal muscle tone and movement pattern, poor postural control, which is a well established fact. Whereas down syndrome have presentation of structural abnormalities of airways and lungs leads to lower respiratory tract infection.^{19,20}

The similarity of respiratory problems among spastic diplegic and cerebral palsy but the PEFR of spastic diplegic is lower compared to normal children. Since normal respiration requires normal function of nervous system, respiratory muscles, costovertebral joint, while there is a compromise in cerebral palsy. In spastic type cerebral palsy there is a significant difference in trunk expansion, respiratory strength and pulmonary function with hemiplegic cerebral palsy.

The PEFR of autism is lower compared to mentally retarded children. Since autism children have low immunity they are more prone to get lung infections.

CONCLUSION

The study conclude that there was a decreased PEFR in children with cerebral palsy,

down's syndrome, autism and mentally retarded. The study can be repeated with large sample size and this can be done by giving interventions like respiratory muscle training .

Conflict of interest

The authors declare that there is no conflict of interest exist

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