ISSN: 2230-9926

Available online at http://www.journalijdr.com

IJDR

International Journal of Development Research
Vol. 5, Issue, 05, pp. 4446-4450, May, 2015

International Journal of
DEVELOPMENT RESEARCH

Full Length Research Article

CONVULSION IN CHILDREN WITH DEVELOPMENTAL DISABILITIES: A HOSPITAL-BASED STUDY

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ARTICLE INFO

Article History:

Received 28th February, 2015
Received in revised form
04th March, 2015
Accepted 13th April, 2015
Published online 31st May, 2015

Key words:

Developmental Disabilities;
Convulsion;
Risk factors.

ABSTRACT

Objectives: To describe the epidemiological risk factors and to determine the likely underlying causes associated with developmentally disabled children with convulsion.

Patients and Methods: Descriptive study (Longitudinal hospital based study) where children with convulsion in developmental disabilities disorder were enrolled in this study. All children admitted to pediatric department or attending the outpatient clinic in Misurata Teaching hospital >2months -15 years of age in the period between January 2012-December 2012 are included in the study. Febrile convulsions and convulsions in developmentally normal children were excluded from the study. The study sample was 55 children with age ranging from three month to 15 years. Prospectively collected data on cases of convulsion with developmental disabilities include; history, clinical examination, investigations, and treatment.

Results: The commonest underling cause of developmental disabilities were neonatal causes, 29 patients (53%) including perinatal asphyxia, and prematurity. The neurodegenerative diseases (13%), congenital anomalies (9%), CNS infection (7%). Regarding categorization of patient according to age, we had 26 patient (47%) <36 month, between 36-72 month 13 patient (24%), and older than 72 month 16 patients (29%). The mean age of patients was 54.4 month (approximately 4.5 year) with standard deviation 46.4. 42 patients (76%) their onset of convulsion was started below one year of age and12 patients (22%) develop status epileptics at hospital.

Conclusion: Among all convulsion-associated variables, the underlying cause (etiology) plus the onset of convulsion, when convulsion begins at an early age, are seems the best predictor of developmental disabilities.

INTRODUCTION

The tendency of the young brain to develop seizures is much greater than that of the adult brain (Hauser and Kurland, 1975; Hauser, 1994). There are many more provoked seizures in neonates and infants than in adults. Their causes may involve trauma, hypoxic-ischemic encephalopathy, hypertension, metabolic abnormalities (amino acid disturbances, hypocalcemia, hypoglycemia, and electrolyte imbalance), infections, pyridoxine dependency, and toxins (Scher, 1996). Similarly, a genetic predisposition to convulsion may be expressed in infancy. Genetic factors may involve congenital cerebral malformations and familial seizures such as neurocutaneous syndromes, genetic syndromes, and benign familial epilepsy (Scher, 1996).

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Additionally, several intractable seizure syndromes occur in early infancy or childhood and not later on (Shields, 1994). Many of previously mentioned conditions lead to Developmental Disabilities (DD) and the prevalence of convulsion in children with DD is significantly higher, ranging from 30% to 50% (Sunder, 1997). Moreover, seizures in developmentally-disabled children are difficult to control (Alvarez *et al*., 1998; Airaksinen *et al*., 2000), with increasing seizure incidence directly proportional to the severity of the developmental disability (Airaksinen *et al.*, 2000). The primarily problems associated with disabled children are number of relevant issues, including the degree and location of brain lesion, the nature of the underlying disease, and the difficulty in treating convulsion. DD is a group of children who share impairments and mandate a common approach to diagnostic evaluation, possible medical requirements, therapeutic needs, interventions, and individual or family challenges to participation and integration (Shevell and Sherr, 2006). The diagnosis of DD is often initially formulated based

on clinical judgment rather than on formal standardized assessments (Shevell and Sherr, 2006). Such judgment should be based on experience with individuals dealing with these patients. In our study we try to identify the epidemiological risk factors associated with developmentally disabled children with convulsion.

MATERIALS AND METHODS

Descriptive study (Longitudinal hospital based study) where children with convulsion in DD disorder were enrolled in this study. All children admitted to pediatric department or attending the outpatient clinic in Misurata Teaching hospital >2months-15 years of age in the period between January 2012-December 2012 are included in the study. Febrile convulsions and convulsions in developmentally normal children were excluded from the study. The study sample was 55 children with age ranging from three month to 15 years. Prospectively collected data on cases of convulsion with DD include; history, clinical examination, investigations, and treatment (Details of relevant clinical information, investigation, and treatment are recorded on a data collecting form). We adapt the following classification:

- International League Against Epilepsy (ILAE) for classification of seizures and of epilepsy syndromes,
- Classification of seizures in infants and ILAE classification core group (Nordli *et al*, 1997; Engel, 2006).

In our study the following definitions were adapted:

Developmental disabilities are defined as condition with functional limitation to one or more activities include self-care, understanding and use of language, learning, mobility, self-direction, and capacity for independent living (Hauser and Hesdorffer, 1990). The term mental retardation ‘‘a disability characterized by significant limitation both in intellectual functioning and in adaptive behavior as expressed in conceptual, social, and practical adaptive skills." (American Association on Mental Retardation, 2002). Cerebral palsy describes a group of disorders of the development of movement and posture, causing activity limitations, that are attributed to non-progressive disturbances that occurred in the developing fetal or infant brain. The motor disorders of cerebral palsy are often accompanied by disturbances of sensation, cognition, communication perception and/or by a seizure disorder (Paneth *et al*, 2005). Epilepsy is a condition characterized by recurrent (two or more) unprovoked seizures separated by more than 24 hours. Convulsion is the clinical manifestation of an abnormal and excessive activity of a set of cortical neurons. Epilepsy syndrome is a constellation of a particular type of seizure (or seizures), EEG features, and other clinical phenomenon often associated with a particular age of onset.

RESULTS

Based on the results of this study, our study sample represents 4.6% from the total hospital admission (1182). Male to female ratio was 1.1: 1. The commonest underling causes of DD were neonatal causes, 29 patients (53%) including perinatal asphyxia, and prematurity. The neurodegenerative diseases seen in7 patient (13%), congenital anomalies (9%), CNS infection (7%), and 10 patient (18%) with other causes (including metabolic, genetic and undiagnosed cases). (**Table1)**.

Table 1. Causes of *DD

Causes of DD	No.	%
**Neonatal causes	29	53
Neurodegenerative diseases	7	13
Congenital Anomalies	5	9
CNS infection	4	7
Others	10	18

*Developmental Disabilities
**Asphyxia, Prematurity± Sepsis

The generalized seizure was the commonest type of convulsion in our study group where 44 patient (80%) present with this type **(Figure 1)**, while the tonic-clonic was the commonest in generalized group (62%).

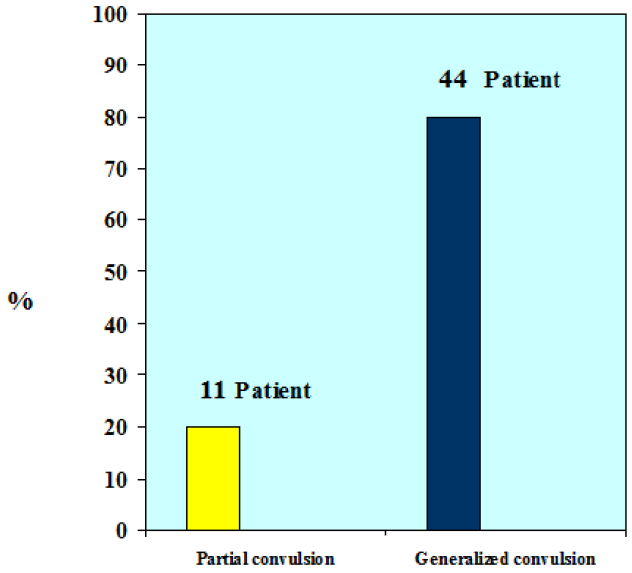

Figure 1. Classification of Convulsion

Regarding categorization of patient according to age, we had 26 patient (47%) <36 month, between 36-72 month 13 patient (24%), and older than 72 month 16 patients (29%). The mean age of patients was 54.4 month (approximately 4.5 year) with standard deviation 46.4 (Table 2).

Table 2. Age of patients

Age	No.	%	Mean Age in month	*SD
<36 month	26	47	14.3	9.3
36-72 month	13	24	56.2	10.2
>72 month	16	29	118.1	20.1
Total=55 patients			54.4	46.4

*Standard Deviation

42 patients (76%) their onset of convulsion was started below one year of age (Figure 2) and12 patients (22%) develop status epileptics at hospital. Neuro-imaging studies were done only in 42 patients (76%) from total study group.

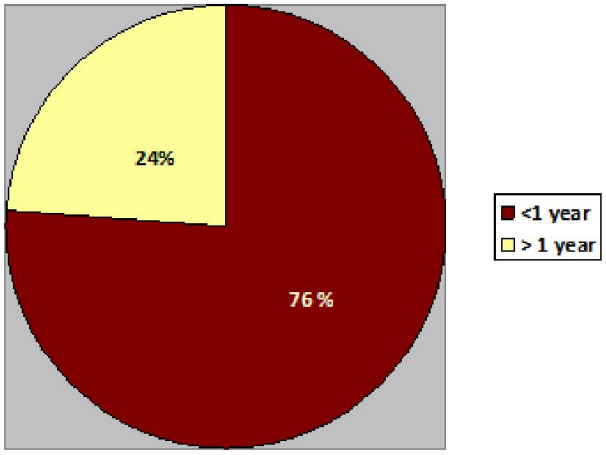

Figure 2. Onset of Convulsion in Children with *DD
*Developmental Disabilities

DISCUSSION

Developmental disabilities are a group of chronic clinically distinct disorders that all share a documented disturbance, in developmental progress in one or more developmental domains compared with established norms (Kinsbourne, 2001). The convulsion considered is important associated complication with these conditions where the accurate diagnosis and appropriate evaluation is the most important challenge in my opinion. Neonatal causes is an important determinant of infant neurological outcome (Sridhar *et al*, 2001). In our study, neonatal causes were the most frequently observed cases accounting for 53% of DD. It was also reported in other studies that seizures are common squeal to neonatal causes in particular to sever perinatal asphyxia (de souza and richards, 1978; de Menezes and Rho, 2002). In another study it was found that perinatal factors were the most common cause of epilepsy (Kwong *et al*., 2001; Miller, 2002; Gunn and Gunn, 1997). The perinatal asphyxia causes a distinctive combination of cerebral palsy, mental retardation, and convulsion.

Findings from studies revealed that when perinatal asphyxia in full-term newborns caused later convulsion, it also caused cerebral palsy (Susser *et al*., 1985; Nelson and Ellenberg, 1981). In the absence of cerebral palsy, no relationship was found between various measures of perinatal asphyxia and the occurrence of epilepsy in later childhood (Nelson and Ellenberg, 1981). Among 87 newborns who had Apgar scores of 0-3 at 10 minutes and who did not develop cerebral palsy, none developed epilepsy during the 7-year followup period (Beran and Flanagan, 1987). The other important cause in neonatal period is the prematurity and the prematurity was the relevant finding in the history of 13% of the studied cases. The problem in our hospital, the majority of preterm baby develop infection, so the DD to the premature babies difficult to be attributed only to the prematurity. When the etiology is identified, the outcome is usually clear. For newborns with extremely low birth weight, the risk of various degree of DD is high and increases with increasing degrees of prematurity, with declining birth weight, with shorter gestation, and with more severe degrees of intraventricular hemorrhage when it is present (Fedrizzi *et al*., 1996; Mikkola *et al*., 2005; Doyle and Casalaz, 2001). Among all related variables, (e.g. etiology of DD, seizure type, seizure control, age at onset of convulsion, and comorbidities, including cognitive impairment), the etiology of the DD has the most pervasive effect on outcome. Studies indicate that associated brain disease, not seizures, is the most important contributor to the severity among children with DD (Mandelbaum and Burack, 1997). Chromosomal disorders illustrate how a particular etiology can produce both seizures and DD independently. Among patients with Down syndrome the chance of the patients with this disorder will develop DD, independent of convulsion. In addition, hypocalcemia which seen frequently in our hospital in neonatal unit, can cause dramatic and numerous seizures, but it does not increase the risk of DD unless there are additional complications. On the other hand, hypoglycemia that causes seizures increase the risk of DD compared to hypoglycemia that does not cause seizures (Fluge, 1975).

CNS infection was an etiological factor for seizures in 7% of cases in our study group. This reflects a low incidence of infection among the studied group while other studies have reported a higher incidence (Scrapa, 1982). They found that CNS infection was an etiological factor in 10% of their cases. Some reported an incidence of seizures of 2-8% in a prospective study of 50 infants who recovered from H. influenza meningitis (Sell, 1983). Our immunization programme may be the reason in decrease the cases of meningitis (H. influenza meningitis) in our community that probably attribute the lower patients in our study of DD secondary to meningitis. The most fundamental elements of neurologic diagnosis are anatomic and etiologic. Where is the lesion, and what caused it? Thus, it is not surprising that the etiology of a child's epilepsy predicts cognitive functioning best. Unfortunately, in some of children in our study with convulsion and DD the accurate etiology cannot be identified. As a result, the diagnosis that can be made is usually descriptive, in terms of the child's seizure type(s) or type of epilepsy or epileptic syndrome. In our study generalized convulsion were seen 80% of the children and the tonic-clonic was the commonest in this group (62%).

It was observed that despite many unusual types of seizures in childhood, the major tonic-clonic convulsions were the commonest manifestation of childhood epilepsy seen in other studies (Kramer *et al*., 1997). Generalized seizures have been linked to greater degrees of DD than partial seizures, but these types of relationships are inconsistent. In study that looked at the effects of partial versus secondary generalized seizures, patients with only partial seizures did better than those with secondary generalization (Giordani *et al*., 1983). When the diagnosis is predominantly rooted in descriptive phenotypic features of the condition-that is, by seizure type or by epileptic syndrome-the relationship between convulsion variables and DD is less predictable. In my opinion classification by seizure type is the least informative level of descriptive diagnosis. iagnosis by type of epilepsy or epileptic syndromes provides a more complete description of the disorder and relationships between convulsion variables and DD are more predictable. Age of onset and duration of convulsion are closely intertwined. Collectively, these variables relate loosely to the overall intensity of the convulsive disorder. 76% of our patients with DD develop convulsion in the first year of life

(Figure 2) and about 47% of our study group are below 3 years of age (Table 2). Status epileptics were seen in 22% of all patients with DD. Investigators have found relationships between the age of onset of seizures and DD. Seizure-related variables can interact simultaneously with etiology and the location of cerebral lesions to contribute to the child's DD. For example, in tuberous sclerosis the age of onset of seizures correlates with DD. Whereas most people with tuberous sclerosis are mentally retarded, virtually all mentally retarded patients with tuberous sclerosis have convulsion, too (Jambaque *et al.*, 1991). Dikman and colleagues evaluated measures that were categorized on the basis of age of onset of seizure (Dikmen *et al.*, 1977). When these investigators compared the patient with this risk factor, the cognitive measures were worse in this risk group who had earliest onset of convulsion especially if the patient had longest duration, and increase frequency of seizures. Similar findings have been reported by others (Oyegbile *et al.*, 2004).

Seizure control usually results in improved cognitive function (Czochanska *et al.*, 1994; Gilliam *et al.*, 1997; Gordon *et al.*, 1996; Marcus, 1993). In our study we can't study precisely the seizure frequency because of poor recall of the families to the seizure frequency. Seizure Frequency is another important factor in determining the degree of DD. Farwell *et al* found that among children whose seizures were controlled, the DD is better than the group with continuing seizures (Farwell *et al.*, 1985). The diagnosis of being developmentally disabled has important consequences because it may qualify the child for important educational and rehabilitative benefits. Although disabled children should have the access to educational and rehabilitative services. Disability determinations are not categorical by diagnosis but rather depend on the child's functional ability. In my opinion, seizures may or may not be handicapping depending on their frequency, severity, and time of occurrence.

Conclusion and Recommendation

Studies of DD are difficult because of the many issues that are involved and various investigators have different theoretical orientations and use different technical approaches. The underlying causes have far-reaching impact on global achievements and adjustment of children who are affected by the condition. Among all convulsion-associated variables, the underlying cause (etiology) plus the onset of convulsion, when convulsion begins at an early age, are seems the best predictor of DD. In the management of any child with a DD, the guiding principle should always be to uncover the primary etiology, which will determine available treatment options, and prognosis. Improving recognition and management of neonatal causes by appropriate perinatal and neonatal care programs can reduce cases of DD. The occurrence of seizures in a child with DD can be an important clue to the presence of an inherited metabolic disease or other genetically determined disorder of the nervous system. As the actual cause may be occult, a systemic approach is needed in the evaluation of these children. In my opinion convulsion in patients with DD should be controlled effectively because uncontrolled seizures in DD patients will persists and can cause more dramatic and pervasive disruption of the acquisition social and cognitive skills of the affected child and can increase the psychological impact to the family.

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