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OUTCOME OF EARLY POSTTRAUMATIC SEIZURE: AN EXPERIENCE IN NIGERIA

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ABSTRACT

Purpose: To determine the frequency, causes, risk factors and outcome following early posttraumatic seizure.

Methods: A retrospective analysis of age, sex, mechanism of injury, type and onset of unprovoked seizure occurring within one week of injury, admission coma score, and Glasgow outcome score in patients with non-penetrating head injury.

Results: Eighty six (10.2%) of 845 head injured patients developed early posttraumatic seizure. They were 55 (64%) children and 31 (36%) older subjects. The seizure was partial in 35% but generalized in 65% of cases. The frequency of seizure increased significantly with decreasing age (p=0.00002) and coma score (p=0.00009) in the seizure group and also in relation to the entire sample (n=845) of head injured patients (p=0.00000). Traffic accident was the leading cause of head injuries (58%), while fall from height (32.5%), domestic injuries (4.2%) and non-penetrating assault (3.5%) were miscellaneous causes. Pedestrian vehicular injury and falls were the commonest mechanisms of injury in children, while older patients were most frequently involved as passengers in auto-crash. Early posttraumatic seizure worsened outcome of head injury, the case mortality rate being 27.9% and 19.2% in patients with and without posttraumatic seizure respectively.

Conclusions: The frequency of early posttraumatic seizure in our setting is 10.2%. This varies significantly with patients' age and initial coma score.

Key words: head injury, early posttraumatic seizure, outcome *(Accepted 14 March 2007)*

INTRODUCTION

Trauma is the greatest threat to life and brain injury is the most common cause of trauma death in childhood[1, 2] and adulthood. In Nigeria, morbidity and mortality from trauma and head trauma in particular are on the increase because of increasing rate of road traffic accidents due to careless and unlicensed driving, bad roads and road designs, bad vehicles and illiteracy[2]. Unfortunately, this trend has not been matched with an improvement in health care service delivery[2]. With only ten neurosurgeons serving a population of 120 million, the general medical officer and general or orthopaedic surgeon plays a substantial role in the care of the acutely head injured[2]

In the developed world, it is estimated that between 0.8-5% of the general population is affected by epilepsy[3, 4] and brain trauma is the cause of epilepsy in approximately 5% of the patients referred to specialized epilepsy centers[5]. Epilepsy is the second most common disease of the nervous system which brings patients to the hospital in Africa6. However, accurate data on its incidence in indigenous sub-Saharan Africa and Nigeria in particular is yet to emerge[7.] Among various risk factors including febrile convulsion, central nervous system infection and infestations, cardiovascular disease and brain tumours, head trauma has been identified as an important etiological factor for epilepsy in Nigeria [8]. In east Africa, trauma to the head was the cause of epilepsy in 8% of the local patients reporting to the neurological clinic at Mulago Hospital [9].

The incidence of epilepsy following head injury in civilian population has not been worked out in many sub Saharan countries and Nigeria in particular, but the quoted frequencies in the western world vary between 1.8 to 5% [10, 11.] Likewise, the pathogenesis of post-traumatic seizure is still unclear[12] but Jennet has identified common risk factors for late posttraumatic seizures, which include early posttraumatic seizures, depressed skull fractures, intracranial haematomas, prolonged unconsciousness, and low Glasgow coma score[13] . Though early posttraumatic seizure is known to be most important single risk factor for the

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of late posttraumatic seizure or epilepsy[13], only scanty systematic review of this subject is available in the literature. The purpose of this study is to determine the frequency, causes, risk factors and outcome of early posttraumatic seizure in a typical Nigerian setting.

METHODS

Cases of non-penetrating head injury admitted through the accident and emergency service of the University Teaching Hospital, Ilorin, Nigeria, between 1990 and 2002 were retrospectively studied. The information about posttraumatic seizure was derived from a review of the medical case notes of the patients, the diagnosis having been established on the basis of a witnessed account of one or more unprovoked seizures. Only subjects with no prior diagnosis of epilepsy, having the first single or multiple seizures within the first week after head injury were included into the study. Their seizures were classified into generalized and partial types. Most of the seizure episodes occurred while patients were still hospitalized for head injury and were witnessed by the medical staff. A single episode was regarded as sufficient for inclusion as traumatic if there was no previous personal or family history of epilepsy. Patients with such history or previous head injury were excluded from analysis. Head injury was graded as mild, moderate or severe employing Glasgow coma scale[14].

Of the 86 patients with posttraumatic epilepsy, all had skull X-rays, nine had a brain computed tomography, and 15 had an awake-electroencephalogram. They were followed up for periods varying between two and seven months (average=three months) during which many were lost to follow-up. The antiepileptic medications administered either parenterally or orally were phenobarbitone in children and phenytoin sodium in adults and older patients. The outcome of head injury which was assessed at discharge, death, or at six months whichever occurred first, was graded as good recovery, moderate disability, severe disability, vegetative state and dead, according to Glasgow outcome scale15. We compared Glasgow outcome scores in patients with and without post-traumatic seizures in order to determine the impact of early post-traumatic seizure on outcome of head injury. The risks of developing early posttraumatic seizure with varying age and coma score within the seizure group and within the entire sample were tested using chi-square technique. P-value less than or equal to 0.05 was taken as significant.

RESULTS

There were 845 head injured patients comprising of 328 (38.8%) children (=16 years), 467(55.3%) adults (17-59 years) and 50 (5.9%) elderly (=60years) subjects. Head injury was mild in 396 (46.9%), moderate in 283 (33.5%) and severe in 166 (19.6%) cases. Of the entire sample (n=845), 86(10.2%) patients developed early posttraumatic seizure (Fig.1 &Table 1). The latter (n=86) comprised of 55 (64%) children, 26(30.2%) adults, and 5(5.8%) elderly subjects. They were 59 (68.6%) males and 27 (31.4%) females (ratio 2:1) aged 1 to 90 years (mean =35 years). Among them (n=86), the seizures were single in 35 (40.7%) and multiple (2-5 episodes) in 51(59.3%) cases. Clinically, seizures were partial in 30 (35%) but generalized tonic-clonic (without a focal onset) in 56 (65%) patients (Table 1). They occurred within 24 hours of injury in 33(38.4%) but within one to seven days in 53 (61.6%) cases.

Within the entire sample (n=845), seizure frequency following head injury, varied significantly with age, being 16.8% in children, 5.6 % in adults and 10% in older patients (p=0.00002). It also varied significantly with coma score; being 27%, 9%, and 4% in severe, moderate and mild head injuries respectively (p=0.00000). Within the seizure group (n=86), the frequency of seizures was significantly related to the initial coma score, being more frequent after severe (52.3 %), than after moderate (29.1%) and mild (18.6%) head injuries (p=0.00009) (Table 2). In the seizure group, traffic accident was the leading cause of head trauma (58%), followed by fall from height (32.5%), domestic injuries (4.2%), non-penetrating assaults (3.5%) and industrial injuries (1.2%) (Table3). Pedestrian vehicular injury and falls were the commonest mechanisms of injury in children, while older patients were most frequently involved as passengers in auto-crash.

The outcome of head injury after one week of hospitalization was insignificantly worsened by early posttraumatic seizure, the case mortality rate being 27.9% and 19.2% in patients with and without

Fig. 1**: Age and sex distribution in 86 patients with early posttraumatic seizure**

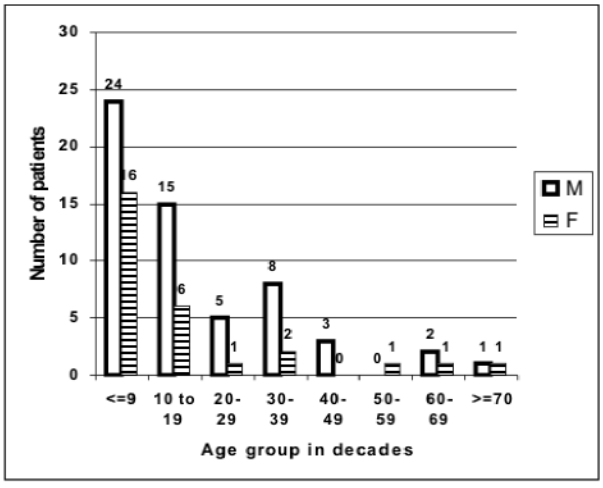

Table 1: **Seizure types according to age groups and sex in 86 patients with early posttraumatic seizure**

Age group (years)	Seizure Type/Sex				Total	Percent
	Generalized		Partial			
	Male	Female	Male	Female		
Children(? 5)	12	5	10	2	29	33.8
Children (6-16)	7	11	6	2	26	30.2
Adults (17-59)	16	3	5	2	26	30.2
Adults (?60)	1	1	2	1	5	5.8
Total	36	20	23	7	86	100

Table 2**: Seizure rate according to head injury severity in 86 patients with early posttraumatic seizure**

Severity of head injury (HI)	All patients	Patients with posttraumatic seizure	Seizure rate according to severity of HI (%)
Mild	396	16	4
Moderate	283	25	9
Severe	166	45	27
Total	845	86	10.2

Table 3**: Causes of Head Injury According to Age in Patients with Early Posttraumatic Seizure**

Causes?	? Age groups (years)?								Total (%)?
	?9	10-19	20-29	30-39	40-49	50-59	60-69	?70	
Road traffic injury	16	16	5	8	2	1	2	0	50(58)
Fall from height	19	2	1	1	0	1	0	2	28(32.5)
Domestic in jury	4	1	0	0	0	0	1	0	4(4.2)
Assault	1	2	0	0	0	0	0	0	3(3.5)
Industrial injury	0	0	0	1	0	0	0	0	1 (1.2)
Total	38	21	6	10	2	2	3	2	86 (100)

Table 4**: Outcome of Head Injury in Patients With and Without Early Posttraumatic Seizure**

Outcome (GOS)	Head injured patients with seizure		Head injured patients without seizure		Total	
	Number	Percent	Number	Percent	Number	Percent
Good recovery	50	58.1	579	76.3	629	74.4
Moderate disability	6	7.0	14	1.8	20	2.4
Severe disability	4	4.7	11	1.5	15	1.8
Vegetative state	2	2.3	9	1.2	11	1.3
Dead	24	27.9	146	19.2	170	20.1
Total	86	100	759	100	845	100

Table 5: **Outcome of Head Injury in Patients with Early Posttraumatic Seizure According To Age Group and Glasgow Coma Score**

Outcome	Severity of head injury (GCS)						Total	Percent
	Severe (GCS=3-8)		Moderate (GCS=9-12)		Mild (GCS=13-15)			
	Children	Adults	Children	Adults	Children	Adults		
Good recovery	10	9	10	7	10	4	50	58.1
Moderate disability	2	2	2	0	0	0	6	7.0
Severe disability	2	1	0	1	0	0	4	4.7
Vegetative state	1	0	1	0	0	0	2	2.3
Dead	13	5	3	1	1	1	24	27.9
Sub-total	28	17	16	9	11	5	86	100
Total (%)	45(52.3%)		25(29.1%)		16(18.6%)		86	100

Seizure respectively (p=0.1316)(Table3). This trend was also true of moderate and severe disabilities and vegetative survival. Over three quarters (76.3%) of patients without posttraumatic seizure recovered fully from head injury, while 58.1% of the seizure group had good recovery (Table 4).

DISCUSSION

Posttraumatic seizure is classified into three groups: immediate seizures (which occur within 24 hours after injury); delayed early seizures (which occur during the first week); and late posttraumatic seizures (which occur more than 1 week after the injury) [16, 17]. The first two groups, usually termed early, was the focus of this study, and these seizures are considered to be direct reactions to brain damage[12]. Late posttraumatic seizures when recurrent are termed posttraumatic epilepsy (PTE), the most commonly investigated form of posttraumatic seizure. PTE occurs after weeks, months or even years of recovery from the original injury[17,18]. Our emphasis on early seizures was prompted by the fact that early posttraumatic seizure has been recognized as the most important single factor contributing to a high incidence of late epilepsy[13]. In a series of 1000 patients, in which only 4.25% of all head injury survivors had early epilepsy, as high as 14.2% of those with late epilepsy had had an early fit[13]. Furthermore, in a resource poor setting like ours, the special problem of illiteracy, ignorance and poor socioeconomic condition, militates against compliance with prolonged patient's follow-up and care.

The present study has confirmed many previous findings and has identified other peculiarities of early posttraumatic seizure in our setting. It has supported the view that early seizures are more frequent in children than in adults[18] and that age is a significant risk factor for the development of early

seizures after head injury. The overall frequency which was 10.2% decreased with advancing age, from 33.8% in children less than 5years, to 5.8% in patients above 60 years. The frequency of early posttraumatic seizure obtained for children aged 16 years and below (32%) in our series was higher than that (8%) obtained by Appleton and Demellweek, [19]. This may be attributable to lower standard of management due to limited neurosurgical and neuroradiologic facilities.

Though the reasons why children are more prone to developing early posttraumatic seizure than adults are not clearly understood, the frequency with which infections precipitate fits at this age, suggests that the child's brain is more susceptible to the development of seizures. In addition, some children may be predisposed to epilepsy by some underlying condition, either congenital or acquired during the perinatal period which, until the head injury has not been brought to light. Moreover, children at this age are more closely observed by their parents and are more likely to be brought to the hospital after a fit has occurred.

The case incidence of early posttraumatic seizure obtained in this series (10.2%) is comparatively higher than values from previous studies. At least one fit occurred within a week of injury in 4.5% of an unselected group of head injured patients with no previous history of epilepsy[15]and other series have reported frequencies varying between 1.8 and 5% [10, 11] in civilian populations. In addition, the gender preference for the male sex in all age groups in the present series is in consonance with the pattern of distribution of epilepsy in the Nigerian general population obtained by Oshuntokun and Odeku[20]. It also agrees with that of Stephan et al [21] who concluded that the incidence of epilepsy seems to be higher in the male in most studies in the general population. This may be a reflection of the well known gender preference of head injury for the male sex[2].

In this study, early seizure was significantly more frequent in patients with severe (27%) compared to those with mild (4%) head injury irrespective of the aetiological factor, corroborating previous reports[10,11,18]. In an earlier series, early seizures occurred in 2-5% of patients suffering from head injury16, but when only severe head injuries were considered, the incidence rose to 10-15% in adults and between 30-35% in children[18]. A more recent study showed that early seizures and the Glasgow coma scale score were specific risk factors for late epilepsy [19]. The finding from this study suggests that coma score is also an important risk factor not only for late seizures but also for early posttraumatic seizure as it significantly influenced seizure frequency.

Often, physicians are at a dilemma on whether to commence antiepileptic medication after a single seizure. Treatment after a single seizure is usually advised in the presence of one or more risk factors for recurrence such as evidence of structural lesion, electroencephalographic abnormalities, and partial seizure [22]. In this retrospective study, both single and multiple seizures were treated with antiepileptic medications without prior identification of risk factors for recurrence and patients were not followed up sufficiently enough to be able to determine the benefit or otherwise of treating single seizures or establishing the frequency of late onset seizures.

Even though head injury contributes to a small percent of the total cases of epilepsy, it is a significant preventable cause of epilepsy[15]. The pathogenesis of epilepsy following head trauma is not clearly understood. This makes identification of risk factors and mechanism of epileptogenesis of posttraumatic epilepsy and the search for preventive strategies of great practical significance. Many theories to explain the mechanism of epileptogenesis have been suggested. Among these are the formation of damaging free radicals by blood in the parenchyma of the brain, increases in excitatory activity following injury, and changes in the inhibitory functions of the brain. Both “haem” and “iron”, the breakdown products of haemoglobin have been shown to have physiological effects on synaptic transmission that may lead to epileptogenesis[23]. The effect of these products is thought to be related to the formation of free radicals which cause direct injury to neuronal membranes and cell death and if antiperoxidant compounds are given, seizure development can be blocked or prevented[18].

This study has revealed that the incidence of early posttraumatic seizure (10.2%) in Nigeria which varied significantly with age and initial coma score is relatively higher than those previously reported elsewhere. It also showed that the case fatality rate was higher in patients with early posttraumatic seizures than in those without. Because of difficulty in ensuring and sustaining a meaningful long-term follow-up, the study was unable to determine the long term outcome of early posttraumatic seizure and its relationship to the occurrence of late epilepsy. A prospective study on long term outcome of early posttraumatic seizure and late epilepsy in Nigerians with head injury is therefore highly desirable.

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