

Original Research Article

Seizures scenario in a tertiary care teaching hospital in Odisha, India-- A retrospective study

Abstract

Purpose: Seizures being one of the major causes of morbidity and mortality in many developing countries still the etiological profile is less documented in many regions. This retrospective study aimed to understand regionally identified etiologies of seizure in Odisha, an eastern coastal province of India.

Methods: Data was retrieved from medical records of seizure patients those who were admitted during between August 2012 to December 2014 in a university teaching hospital. Information about demographics, clinical presentations, imaging studies, and diagnoses were extracted manually from each of the case sheets for analysis.

Results: A total of 519 cases of seizures were admitted in various wards during the above period; a majority were male (63.2%). Presentation was more afebrile (62.04%) than febrile (37.96%), where either forms were predominantly found in children over adults ($p = <0.05$). Among cases with afebrile seizures, the recorded leading causes were hypertensive neuropathy (4.98%), metabolic encephalopathy (3.42%), viral encephalopathy (3.1%), neurocysticercosis (2.8%), and status epilepticus (6.21%). Among cases with febrile seizures, the major etiology was due to an infection (23.35%) where respiratory tract infection was the most common form.

Conclusion: This is the first ever report where etiological profile of febrile and afebrile forms of seizures are identified in Odisha where seizure is a continuing problem. Scenario at one hospital might be the tip of iceberg that tempts to explore the base by either prospective or record based multi-center studies to find more accurate regional burdens of seizure and its causes.

Keywords: Seizure, Febrile seizure, Afebrile seizure, Neuropathy, Encephalopathy, Neurocysticercosis, Medical record, Odisha.

1. Introduction

Seizures are symptoms of a brain malfunction, which happen because of sudden, abnormal electrical activity in the brain. Recurrent seizures are called epilepsy or seizure disorder, which is one of the most common neurological disorders affecting people of all age groups. According to WHO ~50 million people are affected by epilepsy worldwide and nearly 80% of them lives in low and middle income countries [1]. Majority of the global burden of epilepsy is contributed by the two most populous countries India and China [2]. Recent study suggested there are more than 12 million individuals in India lives with epilepsy, which contributes nearly one sixth of the global burden [3]. Usually the geographical variations are thought to be the determinants that influence the common causes in a particular region; several studies from India showed that prevalence rate varies at different times and places [4]. Mostly, central nervous system (CNS) infections are one of the major causes of acquired epilepsy and seizures in developing countries [5,6]. In cases of viral encephalitis, meningitis and neurocysticercosis (NCC) recent onset seizures are more commonly reported [7–9].

Seizures account for about 1% of all emergency visits and about 2% of visits in children emergency department as reported in a hospital based report from a developed country [10]. Seizures are the most common pediatric neurological disorder 4 to 10% of children suffers at least one episode of seizure in the first 16 year of life [11]. In most of the studies febrile seizures are more often seen in pediatric population specifically in the age group younger than 5 year [5,10]. However, there is probably a lack of data on seizures scenario from any comprehensive countrywide study available from the developing world like India. There are only limited studies on cause and outcome of acute seizures in India [12,13].

There is a potential need to understand the patterns of seizures as well as its etiologies in a study population specifically at the tertiary care hospital level; thereby appropriate preventive and/or interventional measures could be implemented in accordance with the causative factors. However, there are probably a number of factors that limit any prospective study in a resource poor setting particularly in developing countries. Heavy patient load, funding limitations, unavailability of neuroimaging facilities, as well as patient unawareness are few noted reasons in most of the underdeveloped regions in India. In this study we therefore attempted to

analyze the etiological spectrum and associated other clinical symptoms in patients with seizures, which was done retrospectively on the medical record data from a previously unexplored province in India.

2. Materials and Methods

This was a retrospective hospital based study conducted in a University teaching hospital in the capital city of the state of Odisha (India). This study was approved by the Institutional Research Ethical committee of Kalinga Institute of Medical Sciences, KIIT University (Odisha, India). During the period from August 2012 to December 2014 a total of 519 patients who were admitted with major presenting complain of seizures were included in the study.

Cases were admitted in our hospital under different clinics viz., pediatrics, general medicine & neurology, psychiatry, ENT, O&G, orthopedics, ophthalmology, and cardiology. The following information was obtained from the medical records of each patient age, sex, type of seizure, associated symptoms (fever, vomiting, cough, diarrhea, headache and other systematic complications) and residential location.

Records of cases with major presenting complain of seizures those were admitted into any of the above clinical departments were included in the study. Only permanent residents of Odisha state were included. Exclusion criteria-records of cases with current address outside Odisha state were excluded Outpatient cases without hospitalization were also excluded.

On the basis of types of seizures, patients were divided into two groups with and with out fever. Patients with temperature more than or equal to 38⁰C were considered in Group 1 and patients with temperature less than 38⁰C were considered in Group 2. Seizures type classification, clinical manifestation and associated symptoms was as per the definitions proposed by International League Against Epilepsy (ILAE) and the International Bureau of Epilepsy (IBE) [14]. Febrile Seizure was defined by 1993 the international league against Epilepsy as, “an epileptic seizure occurring in childhood after one month of age, associated with febrile illness not caused by an infection of the CNS without previous neonatal seizure or previous unprovoked seizure, and not meeting criteria for other acute symptomatic seizure”.

Other etiologies including meningitis, encephalitis, NCC were diagnosed on the basis of recorded clinical and laboratory investigations and verified with standard

references [15,16]. Additionally patients were divided into two age groups- pediatric (≤ 18 years) and adult (>18 years). Variables including age, sex, types of seizures associated symptoms, EEG findings, neuroimaging findings, and residential location were analyzed within the study population. These variables were also compared with children with different age groups. Data was extracted from medical records and entered in a MS-Excel data sheets. The statistical analysis was done using MedCalc statistical software freely available online (<https://www.medcalc.org/calc/>). Comparisons of proportions were calculated in order to analyze differences between sub-groups. The odds ratio (OR), z statistic, and 95% confidence interval parameters were calculated. Test was found significant when P value was obtained to be <0.05 .

3. Results

There were a total of 519 cases whose medical files were studied; all these cases of seizures were admitted in the different wards of Kalinga Institute of Medical Sciences Hospital in Odisha (India). Majority of the patients (60.88%) were admitted in the pediatric department followed by medicine & neurology (35.26%), and psychiatry (2.31%). Record showed 2 patients each from ENT, O&G, and orthopedics departments. There was one case each from ophthalmology and cardiology departments (**Table 1**). We observed that predominantly males (63.2%) were affected with seizures in comparison to females (36.8%) (**Table 2**).

Table 1

Cases of seizures admitted in different wards in the tertiary care hospital

Departments	Numbers (n=519)	Percentages
Pediatrics	316	60.88
General medicine & Neurology	183	35.26
Psychiatry	12	2.31
ENT	2	0.38
O&G	2	0.38
Orthopedics	2	0.38
Ophthalmology	1	0.19
Cardiology	1	0.19

126

127 **Table 2**

128 Gender-wise distribution of seizures cases

	Number of subjects	Percentage
Gender	(n=519)	
Male	328	63.2
Female	191	36.8

129

130 There was a wide age range the minimum and maximum being 1 month and
 131 84 years respectively. We divided the patient age groups as pediatric (≤ 18 years) and
 132 adults (>18 years) where the majority patients were under pediatrics age range
 133 (70.33%). The distributions of cases with seizures under different age ranges are
 134 presented in **Table 3**. Among under five children, majority (24.08%) were newborns
 135 within the age range 1 month to 23 months whereas 20.04% cases were between >2 to
 136 5 years age. Data shows there were only 9 cases of age more than 70 years and out of
 137 them 2 were above more than 80 years.

138

139 **Table 3**

140 Age group wise distribution of admitted cases with seizures

Age groups	Numbers (n=519)	Percentages
< 2 years	125	24.08
2-5 years	104	20.04
>5-18 years	136	26.2
Pediatrics total	365	70.33
>18-30 years	75	14.46
>30-50 years	39	7.52
>50-70 years	31	5.97
>70 years	9	1.73
Adults total	154	29.67

141

142 The data extracted from the patient files revealed that majority of the patients
 143 with seizures admitted into our hospital were from Khurda district where the hospital

144 is located and neighboring districts (**Table 4**). There were 26 cases where no
 145 information about the particular region in Odisha was indicated.

146

147 **Table 4**

148 District wise distribution of admitted patients with seizures

Districts	Numbers (n=519)	Percentages
Khurda	365	70.32
Puri	30	5.78
Dhenkanal	24	4.62
Cuttack	18	3.46
Keonjhar	13	2.50
Nayagarh	12	2.31
Angul	10	1.92
Balasore	4	0.77
Bhadrak	3	0.57
Jagatsinghpur	3	0.57
Balangir	2	0.38
Jajpur	2	0.38
Mayurbhanj	2	0.38
Sambalpur	2	0.38
Ganjam	1	0.19
Koraput	1	0.19
Sundargarh	1	0.19
NOT known*	26	5.00

149 * Of total 519 cases, medical record showed 26 cases to be from Odisha but no
 150 district information was available.

151

152 **Table 5**

153 Seizures cases presenting with or without signs of fever

Clinical categories	Number of subjects (n=519)	Percentage
Afebrile	322	62.04
Febrile	197	37.96

On an overall basis there was a predominance of afebrile seizures (62.04%) over febrile seizures (37.96%) (**Table 5**). The details of the breakdown of the pediatric and adult age groups presenting with either febrile or afebrile seizures are shown in the **Table 6**.

Table 6

Age group distribution of in-patients with seizures presenting with or without signs of fever

Age groups	Afebrile		Febrile	
	N=322	Percentage	N=197	Percentage
< 2 years	41	12.73	84	42.63
2-5 years	41	12.73	63	31.98
>5-18 years	113	35.1	23	11.68
Pediatrics total	195	60.56	170	86.29
>18-30 years	62	19.25	13	6.6
>30-50 years	33	10.25	6	3.05
>50-70 years	23	7.14	8	4.06
>70 years	9	2.8	0	0
Adults total	127	39.44	27	13.71

Of 322 cases presenting with afebrile seizures 127 (39.44%) cases had a diagnosis as per the hospital record. No definite diagnosis was established in rest 195 of 322 (60.56%) cases. We observed status epilepticus (SE) recorded in 20 of 322 (6.21%) cases. Other major underlying conditions in a decreasing order were hypertensive neuropathy (stroke), metabolic encephalopathy, viral encephalitis, NCC, atrophy, congenital epilepsy (**Table 7**).

Non-epileptic attack disorder (NEAD) was recorded in 5 of 322 (1.55%) cases. Other than viral encephalitis and NCC, other infectious causes included

176 tuberculoma, amebic encephalopathy, and *Angiostrongylus* brain infection. There was
 177 one case each diagnosed as meningoencephalitis, and post encephalitis seizures
 178 disorder. Other less common non-infectious cases included Diabetic peripheral
 179 neuropathy, hypoxic-ischemic encephalopathy, alcohol withdrawal syndrome, drug
 180 dependent pseudo seizure, h/o trauma, schizophrenia, ICSOL (unspecified calcified
 181 granulomas, and proencephalic cyst), cerebral palsy, and dapsone hypersensitivity
 182 syndrome.

183

184

185 **Table 7**

186 Diagnostic profile of cases presenting with afebrile seizures

Diagnosis	Number (n=322)	Percentage
Epilepsy (Status epilepticus)	20	6.21
Hypertensive Neuropathy (Stroke)	16	4.98
Metabolic encephalopathy	11	3.42
Viral encephalitis	10	3.1
Neurocysticercosis	9	2.8
Atrophy	7	2.17
Congenital epilepsy	5	1.55
Diabetic peripheral neuropathy	5	1.55
Hypoxic-Ischemic Encephalopathy	5	1.55
Non-epileptic attack disorder	5	1.55
Alcohol withdrawal syndrome	4	1.24
Drug dependent pseudo seizure	4	1.24
Trauma	4	1.24
Meningoencephalitis	3	0.93
Post Encephalitis Seizures Disorder	3	0.93
Schizophrenia	3	0.93
Tuberculoma	3	0.93
Calcified granulomas (Unspecified)	2	0.63
Cerebral palsy	2	0.63
<i>Angiostrongylus</i> infection	1	0.31
Amoebic encephalopathy	1	0.31

Dapsone hypersensitivity syndrome	1	0.31
Proencephalic Cyst	1	0.31
Old case of Meningomyelocele	1	0.31
Snake bite	1	0.31
Undefined	195	60.56

187 Among the febrile cases, the majority (23.35%) was due to an infectious cause
188 (**Table 8**). Among the infectious causes respiratory infections were recorded in 4.58%
189 cases. Viral infection was recorded in 3.04% cases, which presented with fever and
190 seizures. So also 1.52% cases having diagnosed with enteric fever. There was one
191 case of pyrexia of unknown origin (PUO). Also one case of febrile seizure due to
192 insect bites as in the record though no information about the insect was found.

193

194 **Table 8**

195 Diagnostic profile of cases presenting with febrile seizures

Diagnosis	Number (n=197)	Percentage
URTI	16	8.12
Respiratory infection (Undefined)	9	4.58
Viral	6	3.04
Malaria	4	2.03
LRTI	4	2.03
UTI	4	2.03
Enteric fever	3	1.52
Total number of cases with an infectious cause	46	23.35
Atypical febrile seizure	4	2.03
Hypovolemic shock	1	0.51
Pyrexia of unknown origin (PUO)	1	0.51
Postencephalitic seizure disorder	1	0.51
Febrile seizure due to insect bite	1	0.51
Acute febrile illness with no established diagnosis	143	72.58

196

When febrile vs. afebrile presentations of the cases with seizure were analyzed, a statistically significant association was found in case of pediatric subjects comparison to adults (p value<0.0001). However no statistical difference was detected when frequencies of presentations of febrile vs. afebrile seizures were analyzed in male and female patients (Table 9).

Table 9

Association of febrile and afebrile seizures with respect to age and sex

		Afebrile (n=322)	Febrile (n=197)	Odds ratio (95%-CI) z statistics P value
		Number (%)	Number (%)	
Age group	Paediatric	195 (60.56)	170 (86.29)	0.243 (0.153 to 0.387)
	Adult	127 (39.44)	27 (13.71)	z=5.967 <0.0001*
Gender	Male	199 (61.81)	129 (65.48)	0.852 (0.589 to 1.234)
	Female	123 (38.19)	68 (34.52)	z= 0.844 0.3988

* Statistically significant

4. Discussion

The current retrospective study based on medical records provided the scenario of seizure cases in Odisha (India), which was never explored before. Thus the present data might aid in an appropriate disease management and/or preventive plan in future as applicable based on the major contributors recorded in this province which is the gateway to Eastern part of India. The data analysis revealed the highest incidences of seizures in Khurda district of Odisha in which our hospital is located;

220 however, patients with seizures were also originated from 16 other districts of this
221 state.

222 In the present record based study, we found seizures incidences are higher in
223 males than females. Also previous population-based epidemiological studies
224 suggested the prevalence and incidence of seizures and epilepsy to be slightly higher
225 in males than in females [17,18].

226 Majority of patients with febrile seizures were children where we found more
227 incidences in the age group <5 years in comparison to higher age group (5-18 years)
228 children. Previous studies as reported elsewhere even showed higher frequencies of
229 seizures in younger children than older ones [6,10]. Additionally we observed
230 majorities of febrile seizures cases were recorded to affect the newborns among <5
231 years children.

232 We estimated afebrile seizures to be the predominant form over febrile
233 seizures on an overall data analysis. We observed a majority of our patients with
234 afebrile seizures were children. However previous studies from elsewhere reported
235 that febrile seizures are the most common clinical form of seizures among children
236 [5,10]. The higher incidences of seizures in children compared to adults were
237 estimated to be statistically significant in both febrile and afebrile conditions.

238 A recent population based study of comorbidities on epilepsy addressing
239 association with various somatic, psychiatric and neurodevelopmental conditions with
240 epilepsy [19]. We observed majority of cases were epileptic while some other
241 underlying conditions were included viz., hypertensive neuropathy (stroke), metabolic
242 encephalopathy, viral encephalitis, NCC, atrophy, and congenital epilepsy.

243 In new onset of seizures several hypertension has been implicated [19,20].
244 We observed 4.98% cases were associated with hypertensive neuropathy or stroke.
245 Viral encephalitis was also strongly associated with seizures [21]. In our study we
246 found 3.1% cases associated with viral encephalitis those who presented with afebrile
247 seizures.

248 NCC is one of the leading risk factor in *Taenia solium* endemic countries it is
249 estimated that seizures occur nearly in 80% of people affected with NCC [22,23].
250 Similarly our study noted 2.8% of cases were associated with NCC. Though never
251 extensively studied, however NCC has also been previously reported from Odisha
252 either in form of case studies [24–26] or case series [27]. Hence NCC could be
253 considered as a differential particularly in children presenting with afebrile seizures

254 especially with a radio-imaging supportive diagnosis in tropical developing countries
255 or areas endemic for taeniasis/cysticercosis as recommended in a previous report [28].

256 Psychogenic nonepileptic seizures are episodes of abnormal experience and
257 observable behavior that superficially resemble epileptic seizures [29]. Psychogenic
258 seizure or non-epileptic seizure, or pseudo-seizure, are all described under the
259 common terminology non-epileptic attack disorder (NEAD) [30]. A diagnosis of
260 NEAD appeared to have no significant impact on health-related quality of life as
261 reported elsewhere [31]. In our study, we found NEAD in 1.55% among the afebrile
262 seizure cases. When the diagnosis is either never established or established with no
263 known etiology, then the treatment management becomes difficult.

264 The comorbidity of diabetes and epilepsy was indicated in several studies
265 [19,32]. We also found some of the cases of seizures (1.55%), which were associated
266 with diabetes.

267 Alcoholism and drug abuse have been identified as common mental health
268 problems in patients having epilepsy [33]. Some other studies have shown that
269 alcohol withdrawal can also triggers the seizures onset in patients [34,35]. We also
270 observed 1.24% cases those seem to be associated with alcohol withdrawal syndrome.

271 In the current retrospective study, among the cases, which presented with
272 febrile seizures, the major etiology was due to an infectious cause. We found mostly
273 febrile seizures, which seem to be associated with infectious disease viz., upper
274 respiratory tract infection (URTI), viral infection, malaria, lower respiratory tract
275 infection (LRTI), urinary tract infection (UTI) and enteric fever. The details of other
276 causes contributing towards seizures such as, inborn errors of metabolism could not
277 be specified due to lack of adequate information. Probably prospective studies are
278 required to find out more details regarding the problem of multi-centric seizures in
279 Odisha province.

280 SE is defined as seizures lasting for more than five minutes without regaining
281 consciousness [36]. SE is a neurological emergency with significant morbidity and
282 mortality [37]. Multiple SE events, ranging from two to six per patient was reported
283 previously in India [37]. We noticed SE could be established only in 6.21% cases that
284 to be with afebrile seizures among our cases as per records. Previous study from India
285 showed an acute symptomatic etiology in 58.6% of entire cohort (n=126) in a hospital
286 based screening study [36]. In that study a significantly higher percentage of patients
287 with refractory SE had an etiology of CNS infections than non-refractory SE group,

288 and amongst the CNS infections, viral encephalitis was one of the major etiology. In
289 our study among of cases with febrile seizures, only 3.04% had a diagnosis of viral
290 infection. And no confirmed diagnosis was established in 143 cases of which 2 cases
291 had SE (*data not shown*).

292 Seizures still remain a major public health problem although most of its
293 underlying conditions are preventable and treatable. Usually seizure cases are
294 predominantly observed in developing countries over the developed world that might
295 be due to the low socioeconomic conditions, and large gaps in treatment availability
296 to the community. Therefore socioeconomic disadvantage and health problems are
297 common in people with epilepsy (Scambler and Hopkins, 1980; Gaitatzis et al.,
298 2004a). The socioeconomic inequity, huge treatment gap, and the poor epilepsy
299 healthcare delivery system in India are some of the reasons are responsible for the
300 large disease burden. However the present record based study could not provide
301 detailed information on the epidemiological aspect of seizure distribution or so in the
302 study region, which was beyond our scope. In the context of seizures, one recent
303 study from India reported the treatment gap might also causes large disease burden in
304 a population [4]. Hence it is essential to explore different seizures determinants in
305 provinces where no or least information is available previously. Nevertheless we only
306 realized that besides the epidemiological aspects, retrospective hospital record based
307 studies are very crucial while addressing the problem of epilepsy in a particular region
308 particularly identifying the etiologies and their incidences over a time period in a
309 particular region.

310

311 **5. Conclusion**

312

313 This is the first ever report where the etiological profile of febrile as well as
314 afebrile forms of seizures are identified in Odisha state that is a previously unexplored
315 region of India where seizures is a continuing problem. Both febrile and afebrile
316 seizures occurring predominantly in pediatric age group over adults were found to be
317 statistically significant. The information extracted from medical records documented
318 at one hospital may be tip of the iceberg which tempts us to explore the base by
319 further conducting multi-center studies either prospectively or by analyzing medical
320 records for a larger patient population in order to establish a more accurate burden of

different causes of seizures in this region. Also attention should be given on the preventable causes particularly in cases with recent onset seizures.

Conflict of Interest

The authors declare no conflict of interest.

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