Seizure 59 (2018) 60–66

Contents lists available at ScienceDirect

Seizure

journal homepage: www.elsevier.com/locate/yseiz

Clinical spectrum of psychogenic non epileptic seizures in children; an observational study

Priyanka Madaan[a], Sheffali Gulati[a,*], Biswaroop Chakrabarty[a], Savita Sapra[a], Rajesh Sagar[b], Akbar Mohammad[a], R.M. Pandey[c], Manjari Tripathi[d]

[a] Department of Pediatrics, All India Institute of Medical Sciences, New Delhi 110029, India
[b] Department of Psychiatry, All India Institute of Medical Sciences, New Delhi, 110029, India
[c] Department of Biostatistics, All India Institute of Medical Sciences, New Delhi 110029, India
[d] Department of Neurology, All India Institute of Medical Sciences, New Delhi 110029, India

ARTICLE INFO

Article history:
Received 10 September 2017
Received in revised form 25 April 2018
Accepted 26 April 2018

Keywords:
Psychogenic nonepileptic seizures
Short term video EEG
House tree person test
Dialeptic PNES

ABSTRACT

Purpose: The current study was designed to analyze the clinical spectrum of Psychogenic non-epileptic seizures (PNES) in children.
Methods: Children aged 6–16years with clinically suspected PNES, confirmed by short-term VEEG (STVEEG{video electroencephalogram}) and induction were classified as per Seneviratne classification. Stressors, associated co morbidities, Verbal IQ (Intelligence Quotient) and behavioral abnormalities were assessed using HTP(House tree person) test, DSM IV (Diagnostic and statistical manual of mental disorders) TR criteria, MISIC (Malin intelligence scale for Indian children) and CBCL (Child behaviour checklist).
Results: Eighty children with PNES {45 boys; mean age: 10.5 (±1.6) years} were enrolled. Median delay in diagnosis was 5 months {IQR(interquartile range)- 0.5 to 48 months}) and 45% patients were already on AEDs (antiepileptic drugs). Commonest semiology was dialeptic (42.5%), followed by mixed (28.8%), motor (15%) and nonepileptic aura (13.8%). Family stressors were the commonest followed by school related issues. The most common psychiatric comorbidity was adjustment disorder. Somatic complaints were observed in 50% children.
Conclusions: Dialeptic PNES is commonest in children. In resource constrained settings, STVEEG along with induction is a reliable method to diagnose PNES. A comprehensive assessment protocol (including assessment of stressors) is needed for holistic management of pediatric PNES.

1. Introduction

Psychogenic non epileptic seizures (PNES) are paroxysms of altered movement or behaviour, resembling epileptic seizure, with underlying psychogenic basis, but without concurrent electroencephalographic abnormalities [1]. Distinction between epileptic seizures and PNES is challenging but essential. Several terminologies have been used to describe these non epileptic events but "Psychogenic non epileptic seizures (PNES)" is preferable as it indicates the non epileptic nature of these paroxysms.

The prevalence of PNES has been estimated to be 2–33/100,000 [2]. It is presumed that the prevalence of PNES in children is lower than that in adults [3] but there is lack of population based data on pediatric PNES. Although no formal guidelines exist for diagnosing PNES in children, specific history and semiological characteristics are thought to be predictive [4].

Some studies have tried to classify PNES in adults [5–7] with a study using machine learning approach by artificial neural network (ANN) [8]. The latter study showed that the ANN classified PNES in the same way as visual examination in 86.7%. Very few studies have addressed this issue in a pediatric cohort [9–12]. There is dearth of studies focusing on psychological perspective of pediatric PNES. Unlike adults, associated stressors, psychiatric and organic co morbidities are not well defined in children and they lack uniformity in the tools or questionnaires used for identification.

Literature reveals that rhythmic motor PNES are common in adults while dialeptic PNES are the commonest semiological type in young children [5,10,13]. Anxiety and depression are commonly identified psychiatric co-morbidities in adults while studies evaluating this aspect in children are limited. Among 44 children with PNES (with or without epilepsy), underlying psychiatric

* Corresponding author.
E-mail address: sheffaligulati@gmail.com (S. Gulati).

https://doi.org/10.1016/j.seizure.2018.04.024
1059-1311/

diagnosis was conversion disorder (77.4%) with co-morbid medical and psychiatric disorders such as Intellectual disability, specific learning disability and depression in 50% [14]. Patients with pediatric PNES were found to have a significant somato-psychiatric and adversity component to their illness [15]. Sawchuk et al reported that prevalence of internalizing behaviours was around 39% in affected children [16].

The current study provides a detailed analysis of childhood PNES in terms of semiology, and associated social, behavioral and intellectual co-morbidities. An attempt was made to identify relationship between semiology and psychological stressors which may have therapeutic implications.

2. Methods

This observational study was conducted at a tertiary care teaching hospital of North India over a 2 year period after approval from the Institute Ethics Committee (IESC/T-265 & RT-50). Written informed consent was obtained from guardians of all enrolled subjects.

2.1. Primary and secondary objectives

Primary objective was to study the clinical spectrum of PNES and determine proportion of its different semiological types in children aged 6–16 years. Secondary objective was to assess precipitating factors or stressors, associated co-morbidities, Intelligence Quotient (Verbal) and behavioral problems in the study population.

Children (aged 6–16 years) with clinically suspected PNES with at least one episode within preceding 3 months were enrolled, while those with previously appropriately diagnosed epilepsy or movement disorders were excluded. Clinical suspicion was based on suggestive history and clinical examination with presence of three or more of following characteristics [9].

- History of stressors or specific triggers
- Events with gradual onset and fluctuating semiology
- Occurrence of events in presence of observer
- Motor manifestations atypical for epileptic seizures eg. bizarre movements
- Prolonged duration of event without associated post event loss of consciousness
- Persistence despite treatment with antiepileptic medication
- Suggestibility

2.2. Sample size calculation

All suspected cases of Pediatric PNES fulfilling inclusion and exclusion criteria with consenting guardians presenting during the study period were included in the study.

2.3. Detailed methodology

2.3.1. Baseline data

Demographic details, age at diagnosis, delay in diagnosis, history of antiepileptic drug intake, family history of seizures and psychiatric disorders were recorded.

2.3.2. Video EEG recording and semiological analysis

Short term Video EEG (vEEG) recording (2–4 h) was done using Nicolet one system (NicVue software 2.9.1- VIASYS healthcare) as per standard protocol with scalp electrode in accordance with 10–20 international electrode system. In case of failure of spontaneous occurrence of event within one hour of vEEG recording, induction protocols were used in a sequential manner; verbal suggestion followed by placement of a tuning fork followed by body part compression (with hand to induce the event without eliciting pain or discomfort).

The PNES were identified in vEEG [5] as

1) Event without concurrent cortical discharges,
2) Sudden onset of completely obscured EEG with mixture of movement and muscle artifacts,
3) No post event slowing or suppression of background.

All vEEG recorded events were first confirmed as habitual by guardians, later analyzed and classified as per Seneviratne classification [5] and PNES analysis proforma (based on PNES rating scale) [18]. Clinical descriptors of semiology e.g. time for induction, duration of each event, ictal eye closure, localization of motor events with duration were objectively recorded. Pupillary reflexes, menace reflex and hand over face test (in unresponsive patients) were used to aid in diagnosis of PNES [19].

For simplicity, predominant semiology was categorized as motor, dialeptic and non epileptic auras; [8] these 3 groups were compared in terms of stressors, co morbid illnesses, verbal IQ and behavioral problems.

2.3.3. Psychological analysis

Psychological stressors were identified based on history and House tree person test (HTP) [20]. The HTP test is a projective personality test in which test taker responds to ambiguous, abstract, or unstructured stimuli in the form of drawings. Each patient was asked to draw a house, a tree and a person on 3 separate papers without any time constraint following which, he or she was asked questions (provided with test) related to drawings in order to reveal hidden stressors. Guardians were separately interviewed and drawings were later analyzed using an interpretative checklist.

Associated medical co morbidities were assessed based on history and physical examination. Based on DSM IV TR criteria [21], relevant psychiatric co morbidities were identified. Patients were screened for psychiatric disorders (Mood disorder, Panic disorder, Generalised anxiety disorder, Oppositional/defiant disorder, Adjustment disorder, Separation anxiety disorder, Posttraumatic stress disorder) using DSM-IV TR criteria in consultation with a psychiatrist. Verbal IQ was assessed using Malin's Intelligence Scale for Indian Children [22], which is an Indian adaptation of Wechsler intelligence scale for children. Behavioral problems were documented using the caregiver's ratings on the Childhood Behaviour Check list (CBCL) [23]. Narrow band behaviour problems (attention problems, aggressiveness, delinquent behaviour, withdrawn, somatic complaint, anxiety, depression, thought problems and social problems) were assessed. Problems in each domain were further labelled as borderline and clinical range.

All patients were appropriately advised management for co morbidities.

2.3.4. Statistical analysis

Data were collected on a predesigned structured proforma and managed on Microsoft Excel spread sheet. The data were analyzed using Stata 12 software (Stata Corp LP, College Station, TX 7745, USA). The baseline data was described as mean $\pm$ SD. The prevalence of different semiological types was calculated along with the 95% confidence intervals. Chi square test and fisher exact test were used to assess the association between categorical variables where applicable. Independent *t*-test was used for comparing categorical and continuous variables. ANOVA was used for comparing more than two categories with continuous variables.

3. Results

3.1. Patients

During the study period, 1987 patients presented with paroxysmal events. Among 94 patients with clinically suspected PNES, five had appropriately diagnosed epilepsy; hence were excluded. Video EEG recording (done for 89 patients) excluded another nine patients due to induction failure. Therefore, analysis of video EEG records and administration of questionnaires were done for 80 patients (Fig. 1). Demographic characteristics of the cohort are described in Table 1.

3.2. Primary objective-semiological analysis

Spontaneous events (occurring within an hour of video EEG recording) were observed in 5.6% (5/89) patients while induction techniques were used in rest. Events recorded during video EEG were categorized into 6 categories based on Seneviratne classification (Table 2a). Commonest semiology was dialeptic, seen in 42.5% (34/80) patients, followed by mixed in 28.8% patients (23/80). Among motor events, commonest was rhythmic motor followed by complex motor. Across most age ranges, the commonest semiology noted was dialeptic, except for 6–7 years age group. However this age group only included 3 children, so no definitive conclusion can be drawn.

Most events were abrupt in onset with median duration of 180 s (range-11–1500 s). Ictal eye closure was seen in two third of patients. Back arching and pelvic thrusting (typical of adult PNES) were seen in 7 (8.8%) and 4 (5%) patients respectively. Frothing and tongue bite (typical of true seizures) were observed in 2 and 1 subject respectively. The semiological descriptors of PNEE has been summarised in Table 2b).

3.2.1. EEG observations

None of the EEG records showed epileptiform discharges. Different EEG patterns were observed which started and ended abruptly with the event. During dialeptic events and 'aura', the EEG remained grossly unchanged while motor events were associated with movement and muscle artifacts.

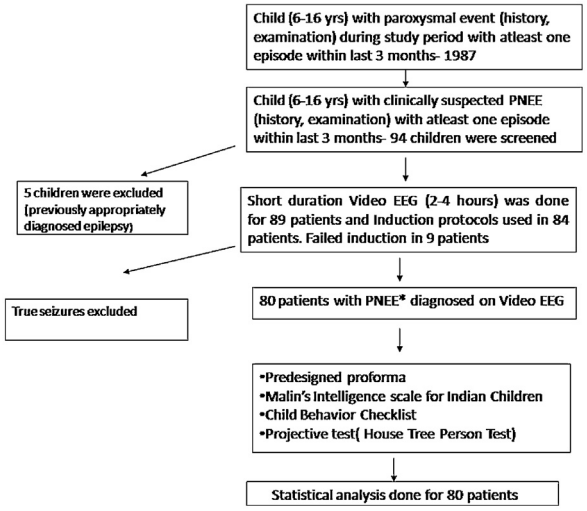

Fig. 1. Flow of the study.

3.3. Secondary objectives

3.3.1. Stressors, associated co morbidities and behavioral problems in children with PNES

Family stressors were most common, seen in 48.8% patients followed by school stressors and problems with self in 21% and 16% patients respectively (Table 3). No obvious stressor was found in 13.8% patients. The interpretation of HTP test has been tabulated (Table 4).

Psychiatric and medical co morbidities were observed in 11/80 (13.8%) and 6/80 (7.5%) cases respectively. Commonest psychiatric co morbidity was adjustment disorder followed by depression and panic disorder (Table 5). Medical co morbidities observed were bronchial asthma, primary nocturnal enuresis, acute intermittent porphyria and Hemolytic Uremic Syndrome.

Based on CBCL, children with PNES had associated somatic complaints in borderline (45%) and clinical range (6.2%). Other common behavioral abnormalities as per caregiver interview were withdrawn depressed behaviour (13.7%) and anxious depressed behaviour (12.5%). Most abnormalities were in borderline range.

Table 1
Clinicodemographic characteristics of children with PNEE.

Baseline characteristics	Patients with PNEE n = 80 (%)		
Mean age (years)(±SD)	10.5 (±1.6)		
Gender	Boys	Girls	Male: Female ratio
PNEE patients (n = 80) (%)	45 (56.2)	35 (43.8)	1.3
6–11 years (n = 61) (%)	37 (60.7)	24(39.3)	1.5
12–16 years (n = 19) (%)	8(42.1)	11(57.9)	0.7
Residence			
Urban	46 (57.5)		
Rural	34 (42.5)		
Socio-economic status			
Upper	3 (3.8)		
Upper-middle	25 (31.2)		
Lower-middle	41 (51.2)		
Upper-lower	11 (13.8)		
Lower	0 (0)		
Median delay in diagnosis in months (range)	5(0.5–48)		
Antiepileptic drug intake (n/percentage)	36 (45)		
Positive family history of psychiatric disorder	6 (7.5)		
Positive family history of seizures	6 (7)		
History of having witnessed a seizure episode	7 (8.8)		

(PNEE: Paroxysmal nonepileptic event).

Table 2a
Percentage distribution of semiological categorization of PNEE based on Seneviratne classification and other semiological parameters and comparison with previous studies.

Semiological categories	Current study (n = 80)	Seneviratne et al (5) (adult, n = 331 events from 61 patients)	Szabo et al (8) (Pediatric, n = 75)	Dhiman et al (9) (Pediatric, n = 56)
Rhythmic motor	10	46.7	24	5.4
Hyper motor	1.2	3.3	0	3.6
Complex motor	3.7	10	13.3	8.9
Dialeptic	42.5	11.2	29.3	14.3
'Aura'	13.8	23.6	28	5.4
Mixed	28.8	5.2	4	16.1
				Unclassified = 26

Verbal IQ in children with PNES, as assessed by MISIC, across all age groups was normal (Mean-100.7 ± 8.1)

3.4. Factors associated with different semiological types and stressors

There was no significant difference in age distribution of patients with different semiology (p = 1). It was found that motor events were more commonly seen in boys (p = 0.01). There was no statistically significant difference in age, and gender distribution of patients with different stressors (p = 0.3 for both). There was no significant association of different semiological types with stressors, verbal IQ and co morbidities (p = 0.3, 0.5 and 0.7 respectively).

4. Discussion

Pediatric PNES is a relatively common indication for referral to tertiary care centres.

In this study, children with PNES were evaluated in order to estimate the prevalence of different semiological types, associated stressors, behavioral abnormalities and co morbidities. The present study reveals higher prevalence of dialeptic and mixed semiology. There are wide variations in the prevalence of different semiological types of PNES; most common semiology described in adults is rhythmic motor while that in children is dialeptic [5–8,10–13,24,25]. This heterogeneity among studies is because of variability in methodology, different populations studied, variable nature of study – prospective or retrospective, inter observer variation, co existent epilepsy and different available semiological classifications. Possible explanation for difference in semiologies in adults and children is that motor events are difficult to execute and may rely on past history of witnessing an event, although this hypothesis is speculative.

Five children with focal epilepsy (2/5) and frontal lobe semiology (3/5), initially suspected to be PNEE, were found to have epilepsy after detailed evaluation. These children were in preteen age group and had recent onset of events which were suggestible. This is in concordance with previous studies where frontal seizures were found to be prevalent in patients with PNES who had concomitant epilepsy as compared to temporal seizures [26].

Table 2b
The frequency distribution of semiological parameters in subjects.

Semiological parameters	N = 80 (%)
Abrupt onset	58 (72.5)
Ictal eye closure	55 (68.8)
Lament/Negative emotion	14 (17.5)
Hyperventilation	13(16.2)
Clenching of teeth	11(13.8)
Back arching	7 (8.8)
Pelvic thrusting	4 (5)
Hiccoughs	3 (3.8)
Frothing	2(2.5)
Tongue bite	1(1.2)
Duration of event (median {range})	180 s (11–1500 s)

The mean age at diagnosis of PNES in children in this study was 10.5 ± 1.6 years which is comparable to previous studies [12]. In 6–11 year age group, there was male preponderance (60.7%) while in adolescent age group, girls outnumbered boys (57.8%). In the present study, most subjects belonged to 6–11 year age group, so overall there was male preponderance. This contrasts the female preponderance which has been previously reported in adult studies. However, in a study by Patel et al, in pediatric population, female preponderance has been reported in adolescent age group [10]. The median duration of lag in diagnosis was 5 months (IQR-0.5 to 48 months) which is less than reports in previous studies [27]. Early referral to a tertiary care center may be a possible reason for this difference.

There was history of antiepileptic drugs (AED) intake prior to diagnosis in 45% patients suggestive of misdiagnosis. This is in accordance with previous studies where unwarranted AED intake was seen in 35% to 75% patients [12]. Thus, early diagnosis and appropriate management will help in avoiding unnecessary AED intake, thereby preventing associated adverse effects, poor scholastic performance and school absenteeism.

Unlike previous studies [11,12], only 5.6% of events were spontaneous. This was possibly because of short term video EEG monitoring, as this was a time bound study being done in resource constrained settings. The current study highlights utility of induction protocols. Induction techniques have been well described in literature [28]. In resource poor setting, without video EEG monitoring, these techniques may be helpful in induction of a habitual event and semiological characterization. This study also opens discussion for comparison between different induction techniques. Failure of induction protocols was observed in 10.7% patients who were excluded from study.

Most common semiology observed was dialeptic in 42.5% of subjects followed by mixed (28.8%). Among the motor events, most common were rhythmic motor followed by complex motor. This went hand in hand with Szabo cohort with dialeptic being the commonest semiology followed by 'aura'. In the Dhiman cohort [12], most were unclassified (probably having mixed semiology). Previous studies have shown a fewer number of patients constituting the mixed category which may be due to inadequate recognition of the chief semiologic patterns (Table 2a). In the current study, mixed events were classified based on predominant semiology (duration based). Most mixed events were predominantly complex motor followed by dialeptic. It was observed that motor events were more common in boys. Most events were abrupt in onset which was in agreement with previous studies [13]. Ictal eye closure was seen in 68.8% of patients. Ictal eye closure has been reported to have a sensitivity of upto 58% and specificity of 80% for the diagnosis of PNES. Negative emotions were seen in around 17% patients. Negative emotional signs like weeping, moaning, screaming have been considered an important

Table 3
Identified stressors in children with PNEE.

Stressors	N = 80 (%)
School related stressors	
Bullying	8(10)
School change/School problems	6 (7.5)
Exam fear	3 (3.8)
Family stressors	
Familial discord	11(13.7)
Sibling rivalry	8(10)
Parental expectation	7 (8.8)
Family illness	6(7.5)
Low income	5 (6.2)
Alcohol abuse in father	2 (2.5)
Self related stressors	
Competitive feeling	5(6.2)
Low self esteem	3 (3.8)
Illness	3 (3.8)
Body image issues	2(2.5)
No stressor/Attention seeking	11 (13.7)

marker of childhood PNES. Back arching and pelvic thrusting, typical of adult PNES, was observed in 8.8 and 5% patients only [29]. Tongue bite and frothing, typical of true seizures, were also observed in about 2% patients.

Identification of stressors for pediatric PNES is less frequently undertaken but have important therapeutic and outcome related implications. It has been observed that adult PNES is precipitated by stressors like physical or sexual abuse, which have been infrequently reported with pediatric PNES [10]. Moreover, stressors are expected to vary depending on environmental and socioeconomic milieu. This study attempted to recognize common stressors based on history and projective personality test (HTP test). Family stressors (most common being familial discord), seen in 48.8% patients, were observed to be most common. This correlated with study by Patel et al in which prevalence of familial discord as a stressor was reported in 42% patients [10]. School related stressors were seen in 21.2% patients in the current study. In previous studies, school difficulties and physical abuse have been reported frequently in adolescents [4,10,15,17]. Since the predominant cohort here was 6–11 year age group, there was low prevalence of school stressors in present study. Self related problems like low self esteem and body image issues were seen in around 15% participants. Observations made from house tree person drawings revealed traits like dependency, withdrawal, self pre occupation and need for warmth. Hence, House Tree Person test provided a semi objective assessment of stressors in affected children while previous studies assessed stressors subjectively [4,10,15].

Psychiatric co morbidities were observed in 13.8% patients while medical co morbidities were seen in 7.5% patients. Medical co morbidities indicate that chronic illness induced stress predispose to PNES. Among psychiatric co morbidities, most common was adjustment disorder (8.8%) followed by depression (2.5%) and panic disorder (2.5%). This was contrary to adult studies where anxiety and depression were most common associated psychiatric co morbidities. Previous pediatric studies have reported conflicting results [10,14,16,25]. Mood disorders and anxiety disorders have been associated in varying numbers. In a study by Yi et al., the most common psychiatric co morbidity was depressive disorder (36%) followed by ADHD (28%), anxiety (12%) and adjustment disorder(8%) [30]. The current study revealed another aspect of psychiatric issues associated with PNES. However, cultural diversity and variability in psychiatric evaluation in children may be responsible for these diverse findings. Appropriately designed studies with adequate sample size are

Table 4
The interpretation of House Tree Person test in the subjects.

Interpretations of drawings of house by children with PNEE	
	N = 80 (%)
Need for warmth, support	28 (35)
Self preoccupation, inaccessibility, withdrawal	27 (33.8)
Over concern for interpersonal relationship	8 (10)
Defensiveness	6 (7.5)
Dependency	5 (6.2)
Need for acceptance by brother or sister/home situation out of control	3 (3.75)
Rejection	3 (3.75)
Interpretations of drawings of tree by children with PNEE	
	N = 80 (%)
Dependency	24 (30.0)
Insecurity	23 (28.8)
Inadequacy	11 (13.8)
Restrictive environment	9 (11.2)
Failure of coping mechanism, self preoccupation, withdrawal	7 (8.8)
Fantasy	5 (6.2)
Anxiety/tension	1 (1.2)
Interpretations of drawings of person by children with PNEE	
	N = 80 (%)
Feeling of inferiority/need for physical strength/high need for achievement	18 (22.5)
Self preoccupation, withdrawal, helplessness	17 (21.3)
Dependency	15 (18.7)
Compensatory social denomination, desire to interact with people	7 (8.7)
Tension/anxiety/forcefulness	6 (7.5)
Impulsivity	6 (7.5)
Insecurity	5 (6.3)
Immaturity	4 (5.0)
Problems in control of need satisfaction	2 (2.5)

Table 5
Co morbidities and behavioural problems in children with PNEE.

Co morbidities		N = 80 (%)
Medical		6 (7.5)
Psychiatric (Based on DSM IV TR)		11 (13.8)
• Panic disorder		2 (2.5)
• Depression		2 (2.5)
• Adjustment disorder		7 (8.8)
• Oppositional Defiant Disorder		1 (1.2)
None		62 (77.5)
Both		1 (1.2)
Behavioural problems	**Borderline**	**Clinical**
Anxious/depressed (n = 80)	7(8.8)	3 (3.8)
Withdrawn/depressed (n = 80)	11(13.8)	-
Somatic complaints (n = 80)	36 (45)	5 (6.2)
Social problems (n = 80)	5(6.2)	3 (3.8)
Thought problems (n = 80)	4 (5)	2 (2.5)
Attention problems (n = 80)	3 (3.8)	1(1.2)
Rule breaking behaviour (n = 80)	9 (11.2)	1 (1.2)
Aggressive behaviour (n = 80)	4 (5)	3 (3.8)

(DSM: Diagnostic and Statistical Manual).

required to delineate significantly associated psychiatric co morbidities.

Behavioural problems have not been frequently reported in children with PNEE. In a study by Patel et al, temper tantrums and aggressive behaviour were seen in 6.7% of patients [10]. In the present study, most children with PNES had associated somatic complaints in borderline range (45%) as well as clinical range (6.2%), without any significant difference between urban and rural settings (p = .6). Somatic complaints have also been reported significantly in previous studies in subjects with PNES and non syncopal psychogenic collapse [31–33].

The strengths of the current study include a comprehensive study with a comparatively large sample size done only on pure PNES population after excluding patients with co existing epilepsy. Besides semiological types, an attempt was made to identify common stressors and co morbidities associated with PNES. These need to be addressed for therapeutic and rehabilitative purposes. Association between stressors and semiological categories was looked into.

The limitations of the current study include the fact that this is a cross sectional study. Patients were recruited from a tertiary care centre and hence may not reflect the disease characteristics at community level. Although screening for psychiatric disorders was done, detailed psychiatric evaluation was not planned as a part of the study. This study was based on short duration Video EEG because of its time bound nature and logistic issues. Although, under ideal circumstances, long term video EEG is recommended for these patients, there are varying diagnostic practices which are followed worldwide, with only 49% paediatricians) using vEEG frequently as part of their diagnostic evaluation [4]. This study highlights the importance of short term video EEG along with induction techniques, for diagnosis of PNES in resource limited setting. Desai et al reported that short term vEEG with verbal suggestion is a cost effective test for diagnosis of PNES and can be a good modality in patients with transient abnormalities in sensorium in the outpatient settings in developing countries [34].

To conclude, the current study highlights the fact that PNEE is a common but frequently missed entity in the pediatric age group. A substantial proportion is falsely diagnosed as epilepsy and started on AEDs. More than 90% of PNES are inducible with simple methods like tuning fork method and verbal suggestion which might help in early diagnosis of this entity in resource constrained settings where long term video EEG may not be feasible. Detailed assessment for underlying psychological stressors and associated psychiatric comorbidities is obligatory for appropriate and holistic management in these children.

Funding

None

Disclosure statement

None of the authors have any conflict of interest to disclose.

Ethical publication statement

We confirm that we have read the Journal's position on issues involved in ethical publication and affirm that this report is consistent with those guidelines.

Acknowledgement

Mrs. Sushila Yadav and Mr. Suresh Kumar, EEG technicians for helping in performing EEGs in these children.

References

[1] Lesser R.. Psychogenic seizures. Neurology 1996;46:1499–507.
[2] Benbadis SR, Allen Hauser W. An estimate of the prevalence of psychogenic non-epileptic seizures. Seizure 2000;9:280–1.
[3] Kim SH, Kim H, Lim BC, et al. Paroxysmal nonepileptic events in pediatric patients confirmed by long-term video-EEG monitoring–single tertiary center review of 143 patients. Epilepsy Behav 2012;24:336–40.
[4] Wichaidit BT, Østergaard JR, Rask CU. Diagnostic practice of psychogenic nonepileptic seizures (PNES) in the pediatric setting. Epilepsia 2015;56:58–65.
[5] Seneviratne U, Reutens D, D'Souza W. Stereotypy of psychogenic nonepileptic seizures: insights from video-EEG monitoring. Epilepsia 2010;51:1159–68.
[6] Hubsch C, Baumann C, Hingray C, Gospodaru N, Vignal JP, Vespignani H, et al. Clinical classification of psychogenic non-epileptic seizures based on video-EEG analysis and automatic clustering. J Neurol Neurosurg Psychiatry 2011;82:955–60.

[7] Wadwekar V, Nair PP, Murgai A, Thirunavukkarasu S, Thazhath HK. Semiologic classification of psychogenic non epileptic seizures (PNES) based on video EEG analysis: do we need new classification systems? Seizure 2014;23:222–6.
[8] Magaudda A, Laganà A, Calamuneri A, Brizzi T, Scalera C, Beghi M, et al. Validation of a novel classification model of psychogenic nonepileptic seizures by video-EEG analysis and a machine learning approach. Epilepsy Behav 2016;60:197–201.
[9] Patel H, Dunn DW, Austin JK, et al. Psychogenic nonepileptic seizures (pseudoseizures). Pediatr Rev 2011;32:e66–72.
[10] Patel H, Scott E, Dunn D, Garg B. Nonepileptic seizures in children. Epilepsia 2007;48:2086–92.
[11] Szabó L, Siegler Z, Zubek L, et al. A detailed semiologic analysis of childhood psychogenic nonepileptic seizures. Epilepsia 2012;53:565–70.
[12] Dhiman V, Sinha S, Rawat VS, et al. Children with psychogenic non-epileptic seizures (PNES): a detailed semiologic analysis and modified new classification. Brain Dev 2014;36:287–93.
[13] Reilly C, Menlove L, Fenton V, Das KB. Psychogenic nonepileptic seizures in children: a review. Epilepsia 2013;54:1715–24.
[14] Rawat VS, Dhiman V, Sinha S, Sagar KJV, Thippeswamy H, Chaturvedi SK, et al. Co-morbidities and outcome of childhood psychogenic non-epileptic seizures-––an observational study. Seizure 2015;25:95–8.
[15] Plioplys S, Doss J, Siddarth P, Bursch B, Falcone T, Forgey M, et al. A multisite controlled study of risk factors in pediatric psychogenic nonepileptic seizures. Epilepsia 2014;55:1739–47.
[16] Sawchuk T, Buchhalter J. Psychogenic nonepileptic seizures in children — Psychological presentation, treatment, and short-term outcomes. Epilepsy Behav 2015;52.
[17] Bhatia MS, Sapra S. Pseudoseizures in children: a profile of 50 cases. Clin Pediatr (Phila) 2005;44:617–21.
[18] Cianci V, Ferlazzo E, Condino F, et al. Rating scale for psychogenic nonepileptic seizures: scale development and clinimetric testing. Epilepsy Behav 2011;21:128–31.
[19] Irwin K, Edwards M, Robinson R. Psychogenic non-epileptic seizures: management and prognosis. Arch Dis Child 2000;82:474–8.
[20] Wenck L. House tree person test. WPS Publishers Bell State University; 1977.
[21] Diagnostic and statistical manual of mental disorders DSM-IV-TR (Fourth ed.). Washington D.C: American Psychiatric Association, 2000.
[22] Malins A. Malins Intelligence Scale for Children- Manual. Lucknow: Indian Psychological Corporation; 1969.
[23] Achenbach T. Child Behaviour Checklist. ASEBA, University of Vermont; 2001.
[24] Uldall P, Alving J, Hansen LK, Kibaek M, Buchholt J. The misdiagnosis of epilepsy in children admitted to a tertiary epilepsy centre with paroxysmal events. Arch Dis Child 2006;91:219–21.
[25] Verrotti A, Agostinelli S, Mohn A, et al. Clinical features of psychogenic non-epileptic seizures in prepubertal and pubertal patients with idiopathic epilepsy. Neurol Sci Off J Ital Neurol Soc Ital Soc Clin Neurophysiol 2009;30:319–23.
[26] Pillai JA, Haut SR. Patients with epilepsy and psychogenic non-epileptic seizures: an inpatient video-EEG monitoring study. Seizure 2012;21:24–7.
[27] Valente KD, Alessi R, Vincentiis S, Santos P, Santos P, Rzezak Bd. Risk factors for diagnostic delay in psychogenic non-epileptic seizures among children and adolescents. Pediatric Neurol 2017;67:71–7.
[28] Parra J, Kanner AM, Iriarte J, Gil-Nagel A. When should induction protocols be used in the diagnostic evaluation of patients with paroxysmal events? Epilepsia 1998;39:863–7.
[29] Leis AA, Ross MA, Summers AK. Psychogenic seizures: ictal characteristics and diagnostic pitfalls. Neurology 1992;42:95–9.
[30] Yi YY, Kim HD, Lee JS, Cheon KA, Kang HC. Psychological problems and clinical outcomes of children with psychogenic non-epileptic seizures. Yonsei Med J 2014;55:1556–61.
[31] Salpekar JA, Plioplys S, SiddarthP. Bursch B, Shaw RJ, Asato MR, et al. Pediatric psychogenic nonepileptic seizures: a study of assessment tools. Epilepsy Behav 2010;18:50–5.
[32] Heyer GL. Youth with psychogenic non-syncopal collapse have more somatic and psychiatric Symptoms and lower perceptions of peer relationships than youth with syncope. Pediatr Neurol 2018;79:34–9.
[33] Gale SD, Hill SW, Pearson C. Seizure semiology in males with psychogenic nonepileptic seizures is associated with somatic complaints. Epilepsy Res 2015;115:153–7.
[34] Desai SD, Desai D, Jani T. Role of short term video encephalography with induction by verbal suggestion in diagnosis of suspected paroxysmal nonepileptic seizure-like symptoms. Epilepsy Res Treat 2016;2016:2801369.