Epilepsy & Behavior 27 (2013) 427–432

Semiological characteristics of adults with psychogenic nonepileptic seizures (PNESs): An attempt towards a new classification

Vikas Dhiman a, Sanjib Sinha a,⁎, Vikram Singh Rawat b, Thippeswamy Harish b, Santosh K. Chaturvedi b, Parthasarathy Satishchandra a

a Department of Psychiatry, National Institute of Mental Health and Neurosciences (NIMHANS), Bangalore, India
b Department of Neurology, National Institute of Mental Health and Neurosciences (NIMHANS), Bangalore, India

A R T I C L E   I N F O

Article history:
Received 2 January 2013
Revised 7 March 2013
Accepted 9 March 2013
Available online xxxx

Keywords:
Classification
Nonepileptic
PNES
Pseudoseizures
Psychogenic
Semiology

A B S T R A C T

This study was carried out to analyze the semiological characteristics of adults with psychogenic nonepileptic seizures (PNESs) and to propose a modified new classification of PNESs. This retrospective analysis included 82 patients (M:F = 38:44; mean age: 33.4 ± 12.0 years) diagnosed to have PNESs based on video-EEG recording. Detailed semiological characteristics including pattern of limb movements, body movements, psychological/emotional manifestations, “aura”, level of consciousness, age at onset of PNESs, age at diagnosis, and history of AED intake were recorded. We classified our cohort of patients as per available classifications and proposed a modified new classification. Age at onset of PNESs was 21.8 ± 14.1 years (range: 2–64; median: 18.5 years), age at diagnosis was 29.3 ± 12.7 years (range: 2–62; median: 26.0 years), and delay in diagnosis was 7.4 ± 7.3 years (range: 0–28; median: 5.0 years). There were 369 recorded attacks (range: 1–10; median: 4). Prior to VEEG, 47 (57.3%) patients were incorrectly diagnosed as having true epileptic seizures initially and were on antiepileptic drugs (AEDs), 15 (18.3%) patients had an initial diagnosis of PNESs which remained unchanged after VEEG analysis, and 20 (24.4%) patients had both PNESs and epileptic seizures. We could not classify 40–66% of our patients into any of the available classification proposed by previous authors. We categorized all our patients into the following categories of a modified new classification: abnormal hypermotor response: 23 (28%), abnormal partial motor response: 18 (22%), affective/emotional behavior phenomena: 4 (4.9%), dialeptic type: 5 (6.1%), nonepileptic aura: 5 (6.1%), and mixed pattern: 27 (32.9%). Incorrect diagnosis of PNESs leads to unnecessary prescription of AEDs, with side effects and cost implications. A modified systematic classification of PNESs is proposed which would help in the better characterization of PNESs.

© 2013 Elsevier Inc. All rights reserved.

1. Introduction

Psychogenic nonepileptic seizures (PNESs), also known as pseudoseizures or nonepileptic attack disorder (NEAD), are defined as paroxysmal events that are characterized by a change in behavior or consciousness and resemble epileptic seizures but do not result from an excessive neuronal discharge, do not have EEG changes of seizures, and are psychologically determined [1–4]. These comprised 4–5% of patients who were thought to have epilepsy based on a population study in Iceland [5]. About 9 to 50% of the referrals to refractory epilepsy clinics are reported to have PNESs [6,7].

The diagnosis of PNESs is often difficult and is based on a proper history from the patient and/or an eyewitness, direct observation of the event, and the EEG record during the event [8]. Patients with PNESs are often misdiagnosed with epilepsy and prescribed antiepileptic drugs (AEDs), which have their own implications including side effects, cost, potential teratogenicity, and psychosocial impact [9]. Video-EEG (VEEG) recording of the attack is the gold standard in investigating the difference between PNESs and epileptic seizures, particularly frontal lobe seizures. Recording of the typical attack along with the concurrent EEG has shown that PNESs are more common than previously believed [10]. A few studies have tried to establish diagnostic guidelines and classify the semiological pattern of PNESs, but there seems to be an incomplete understanding and a lack of uniformity because of its varied manifestations [1–4,11,12].

On most occasions, the delay in the diagnosis or the wrong diagnosis of PNESs is related to improper decisions by a physician [13,14] and sometimes caused by the lack of established criteria to diagnose PNESs [11]. Identification of the clinical features and patterns of the attack would be useful for diagnosing and classifying PNESs and would be useful for better screening of the patients and confirming the diagnosis in cases where VEEG facilities are not available [15].

The aims of this study were to evaluate the ictal semiological characteristics and patterns of the attack in a large cohort of patients...
diagnosed with PNESs based on video-EEG recording of the events and to propose a modified classification of PNESs in adults based on the analysis.

2. Methods

This observational hospital-based study was carried out in the neurology and psychiatry departments at a university teaching hospital and a major tertiary care center for neuropsychiatry patients in south India. All the patients older than 18 years admitted for video-EEG monitoring from August 2005 to August 2012 and diagnosed with PNESs were included in the study for analysis. Out of a total of 1281 VEEGs performed during this period, 139 (10.8%) patients were diagnosed with PNESs based on the VEEG analysis, and among them, 82 (6.4%) patients were adults (≥18 years) who were included in this study. All the patients were admitted in the epilepsy monitoring unit (EMU) for video-EEG monitoring for any of the following three reasons: a) to diagnose the event as either epilepsy or PNESs, b) to classify the seizure type, and c) to evaluate the patient for presurgery. Informed consent was obtained from all the patients for video-EEG monitoring and academic purposes.

Routine scalp EEG and VEEG recordings were carried out using the Galileo EB Neuro system (Italy) as per standard criteria. The standard 10–20 system of electrode placement was used to record epileptiform discharges during conventional scalp- and video-EEG recordings, and seizure semiology and EEG changes (if any) were observed. All the patients underwent VEEG recording for a mean duration of 1.8 days (range: 1–3; median: 2 days). Patient’s responses (if any) to suggestion techniques during and after the attacks were recorded. The data related to 82 patients were retrieved from the server maintaining the patients’ data.

Each of the recorded attacks was analyzed independently by two epileptologists (SS and PSC). The differences in the interpretation of seizure characteristics among them were resolved by mutual discussion and arriving at a consensus. The criteria used to diagnose PNESs were the following: a) at least one habitual attack should have been recorded on VEEG, b) no ictal EEG changes suggesting epilepsy were noted during the event, c) no postictal EEG changes, d) no evidence of any other neurological condition responsible for the events, and e) evaluation and agreement of the diagnosis by a team of psychiatrists (VSR, TH, and SKC). Occurrence of coexistent epilepsy was not an exclusion criterion.

The pattern of semiological characteristics of our cohort was classified based on the semiological classifications of PNESs derived from the literature [1–4,11,16]. It was noted that some of the study patients could not be classified based on the available classifications (Table 1). The semiological characteristics in this cohort could be stratified into the following five major categories: a) abnormal motor responses comprising (i) hypermotor responses (including asynchronous out-of-phase limb movements, violent thrashing/grabbing/kicking movements, whole body rigidity, and flaccidity) and (ii) partial motor responses (including flexion/extension or side-to-side movements of the head/neck/limbs); b) affective/emotional behavior phenomena (including grimacing, weeping, grunting, moaning, and screaming); c) dialeptic type (including coma-like state, fall, or no response to external stimuli); d) nonepileptic aura (including subjective feeling without any external manifestations, dizziness before the attack, and pressing the alarm button themselves); and e) mixed pattern (a combination of two or more subtypes in a patient). The details of each characteristic are provided in the Results section. The definition/criteria of each category and the details of the semiology of PNESs to be included in each category are provided in Table 2.

All the data were entered into an MS Excel spreadsheet. The mean, median, standard deviations, and frequency were calculated for various variables using SPSS software version 16.0.

3. Results

3.1. Patients and demographic details

A total of 82 adults (M:F = 38:44; mean age: 33.4 ± 12.0 years; range: 18–70 years) with PNESs on video-EEG monitoring were included. The mean frequency of the PNES attacks in patients was 23.3 ± 32.2 per month at the time of evaluation, ranging from 1 per month to as high as 120 per month (median: 5.0 per month). The mean age at onset of PNESs was 21.8 ± 14.1 years (range: 2–64; median: 18.5 years). The mean age at diagnosis of PNESs was 29.3 ± 12.7 years (range: 2–67; median: 26.0 years). The mean duration of the illness before the diagnosis of PNESs was 7.4 ± 7.3 years (range: 0–28; median: 5.0 years) (Table 3).

<table>
<thead>
<tr>
<th>Classification of Meierkord et al. [1] [n = 110]</th>
<th>Classification of Groppel et al. [4] [n = 27]</th>
<th>Classification of Seneviratne et al. [11] [n = 61]</th>
<th>Present classification [2012] [n = 82]</th>
</tr>
</thead>
<tbody>
<tr>
<td>[their cohort]</td>
<td>[present cohort]</td>
<td>[their cohort]</td>
<td>[present cohort]</td>
</tr>
<tr>
<td>Attacks of collapse — 1/3rd</td>
<td>Psychogenic motor seizures (CC: 0.250–0.964)</td>
<td>Rhythmic motor — (46.7%)</td>
<td>I. Abnormal motor response</td>
</tr>
<tr>
<td>Attacks with prominent motor activity — 2/3rd</td>
<td>Psychogenic minor motor seizures or trembling (CC: 0.286–0.857)</td>
<td>Hypermotor — (3.3%)</td>
<td>A. Hypermotor — 23 (28%)</td>
</tr>
<tr>
<td></td>
<td>Psychogenic atomic seizures (CC: 0.250–0.679)</td>
<td>Complex motor type — (10%)</td>
<td>B. Partial motor — 18 (22%)</td>
</tr>
<tr>
<td>Unclassifiable: 54 (65.9%)</td>
<td>Unclassifiable: 46 (56.1%)</td>
<td>Dialeptic type — (11.2%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nonepileptic aura — (23.6%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mixed pattern — (5.2%)</td>
<td></td>
</tr>
</tbody>
</table>

4 Classification was based on cluster analysis of the symptoms, CC: cluster coefficient.

5 Classification was based on the semiological classifications of PNESs derived from the literature [1–4,11,16]. It was noted that some of the study patients could not be classified based on the available classifications (Table 1). The semiological characteristics in this cohort could be stratified into the following five major categories: a) abnormal motor responses comprising (i) hypermotor responses (including asynchronous out-of-phase limb movements, violent thrashing/grabbing/kicking movements, whole body rigidity, and flaccidity) and (ii) partial motor responses (including flexion/extension or side-to-side movements of the head/neck/limbs); b) affective/emotional behavior phenomena (including grimacing, weeping, grunting, moaning, and screaming); c) dialeptic type (including coma-like state, fall, or no response to external stimuli); d) nonepileptic aura (including subjective feeling without any external manifestations, dizziness before the attack, and pressing the alarm button themselves); and e) mixed pattern (a combination of two or more subtypes in a patient). The details of each characteristic are provided in the Results section. The definition/criteria of each category and the details of the semiology of PNESs to be included in each category are provided in Table 2.

All the data were entered into an MS Excel spreadsheet. The mean, median, standard deviations, and frequency were calculated for various variables using SPSS software version 16.0.

3. Results

3.1. Patients and demographic details

A total of 82 adults (M:F = 38:44; mean age: 33.4 ± 12.0 years; range: 18–70 years) with PNESs on video-EEG monitoring were included. The mean frequency of the PNES attacks in patients was 23.3 ± 32.2 per month at the time of evaluation, ranging from 1 per month to as high as 120 per month (median: 5.0 per month). The mean age at onset of PNESs was 21.8 ± 14.1 years (range: 2–64; median: 18.5 years). The mean age at diagnosis of PNESs was 29.3 ± 12.7 years (range: 2–67; median: 26.0 years). The mean duration of the illness before the diagnosis of PNESs was 7.4 ± 7.3 years (range: 0–28; median: 5.0 years) (Table 3).
There were coexistent epileptic seizures in 20 (24.4%) patients. The commonest seizure types were complex partial seizures (n = 12; 14.6%), generalized tonic–clonic seizures (n = 4; 4.9%), and simple partial seizures (n = 4; 4.9%). The semiology of the coexistent epileptic seizures was different from the PNES attacks as expected. Routine scalp EEG showed interictal epileptiform discharges in 13 patients (whole cohort – 15.9%) and those with epileptic seizures – 65%). On further analysis, prior to video-EEG recording, we observed that 47 (57.3%) patients were initially diagnosed as having epileptic seizures on their first visit to any physician, and they were started on antiepileptic drugs (AEDs); in 15 (18.3%) patients, the initial diagnosis of PNESs was made which remained unchanged after VEEG analysis; 20 (24.4%) patients were diagnosed to have both PNESs and epileptic seizures. Sixty-seven (81.7%) patients were on AEDs at the time of their first visit to any physician, and they were started on antiepileptic drugs. In 15 (18.3%) patients, the initial diagnosis of PNESs was made which remained unchanged after VEEG analysis; 20 (24.4%) patients were diagnosed to have both PNESs and epileptic seizures. The most common AEDs prescribed were the following: clobazam (n = 40; 48.8%), carbamazepine (n = 32; 39.0%), and sodium valproate (n = 22; 26.8%). Fifty-four patients were on polytherapy. Magnetic resonance imaging of the brain was carried out in 39 (47.6%) patients and was abnormal in 10 (25.6%) of them. In the subgroup with only PNESs (n = 62), 26 patients had undergone MRI [normal – 24 (92.3%), cerebral atrophy – 1 (3.8%), and incidental small meningioma – 1 (3.8%)]. Among the patients with both PNESs and epileptic seizures (n = 16; 19.5%), MRI was done for 13 [8 (61.5%) (MTS = 4, non-MTS = 4) showed abnormal imaging, and 5 (38.5%) showed normal imaging].

3.2. Semiological characteristic of PNESs

In 82 patients, 369 attacks were recorded. In 60 (73.2%), there was an abrupt onset, while in 22 (26.8%), there was a gradual onset, i.e., evolution involving either the whole body or a part of the body. Preictal

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M:F</td>
<td>38:44</td>
</tr>
<tr>
<td>Married</td>
<td>46 (56.1)</td>
</tr>
<tr>
<td>Education</td>
<td></td>
</tr>
<tr>
<td>Undergraduate</td>
<td>50 (61.0)</td>
</tr>
<tr>
<td>Graduate</td>
<td>25 (30.5)</td>
</tr>
<tr>
<td>Postgraduate</td>
<td>7 (8.5)</td>
</tr>
<tr>
<td>Stress</td>
<td>17 (20.7)</td>
</tr>
<tr>
<td>Anxiety</td>
<td>8 (9.8)</td>
</tr>
<tr>
<td>History of depression</td>
<td>15 (18.3)</td>
</tr>
<tr>
<td>History of anxiety disorders</td>
<td>14 (17.1)</td>
</tr>
<tr>
<td>History of mood disorders</td>
<td>6 (7.3)</td>
</tr>
<tr>
<td>Family history of seizures</td>
<td>5 (6.1)</td>
</tr>
<tr>
<td>Coexistent neurological deficit</td>
<td>11 (13.4)</td>
</tr>
<tr>
<td>Incontinence</td>
<td>100</td>
</tr>
<tr>
<td>Blitting</td>
<td>100</td>
</tr>
<tr>
<td>Postattack snorting</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 3
Patient-related characteristics in PNESs (n = 82).

Table 4
General characteristics of PNESs and their frequency in 82 patients.
Patients, while it lasted for <2 min for the other half. The descriptions of PNESs are as follows:

1) **Semiological subtypes of PNESs**: Based on the analysis of events in the 82 patients, the following five subtypes were noted [Tables 2 and 4].

   a) **Abnormal motor phenomena**: These consisted of the following two subtypes: i) **Hypermotor phenomena**, consisting of asynchronous out-of-phase limb movements, were observed in 27 (32.9%) patients. Violent thrashing, grabbing, and kicking movements were noted in 16 (19.5%) patients, which were generalized in 10 (12.2%) patients and involved the upper limbs in 3 (3.7%) patients and the lower limbs in 3 (3.7%) patients. Pelvic thrusting was recorded in 21 (25.6%) patients: 19 (23.2%) of whom showed the forward type of pelvic thrusting, while only 2 (2.4%) patients showed the backward type of pelvic thrusting. Ophthotonic posturing of the trunk was observed in 2 (2.4%) patients. Associated whole body jerking and rigidity were noted in 32 (38%) and 7 (8.5%) patients, respectively, in the present study, while additional whole body flaccidity was observed in 8 (9.8%) patients. ii) **Partial motor phenomena**: a large number of patients presented with abnormal movements involving parts of the body. ‘Flexion–extension’ movements of the upper limbs [26 (31.7%) and the lower limbs [28 (34.1%); ‘side-to-side’ repetitive head movements [24 (29.3%)]; and ‘flexion–extension’ movements of the head [14 (17.1%)]. There were no motor phenomena associated with it. In affective/emotional behavior phenomena, there was also studded with muscle and movement artifacts. During the record was obliterated by very high amplitude movement and muscle artifacts, which occurred in varying amplitudes and frequencies. At the end of the attack, the EEG was normal immediately with no postictal changes. After analyzing the EEG record using different filter settings and monopolar and bipolar montages, it was noted that in the hypermotor PNESs (IA), the record was obliterated by very high amplitude movement and muscle artifacts, while in the partial abnormal type (IB), the EEG was also studded with muscle and movement artifacts. During rhythmic or semirhythmic movement of body parts, similar artifacts were observed. In affective/emotional behavior phenomena, there were either no EEG changes or subtle muscle artifacts mainly involving the facial, jaw, and pharyngeal muscles. During the dialeptic type of attacks and nonepileptic aura, the EEG largely remained unchanged [Fig. 1(A–D)].

3.3. EEG observations

As per the definition of PNESs, we did not find any EEG changes suggestive of true epileptic seizures, but we observed different EEG patterns in different types of PNESs. These EEG changes were mainly due to body part movement and muscle artifacts, which occurred in varying amplitudes and frequencies. At the end of the attack, the EEG was normal immediately with no postictal changes. After analyzing the EEG record using different filter settings and monopolar and bipolar montages, it was noted that in the hypermotor PNESs (IA), the record was obliterated by very high amplitude movement and muscle artifacts, while in the partial abnormal type (IB), the EEG was also studded with muscle and movement artifacts. During rhythmic or semirhythmic movement of body parts, similar artifacts were observed. In affective/emotional behavior phenomena, there were either no EEG changes or subtle muscle artifacts mainly involving the facial, jaw, and pharyngeal muscles. During the dialeptic type of attacks and nonepileptic aura, the EEG largely remained unchanged [Fig. 1(A–D)].

4) **Eye manifestations**: In half of the subjects (n = 41; 50%), forceful eye closure during the event was noted, and in 21 (25.6%) of these patients, the eyes could open and remain open during the attack upon command and/or suggestion from the EEG technician. In 40 (48.8%) patients, the eyes remained open with a staring look or side-to-side movements of the eyeballs. In one of the attacks, the eyes did not face the camera.

5) **Breathing pattern**: Hyperventilation during and after the attack was observed in 20 (24.4%) patients. It was observed that 51 (62.2%) patients had regular deep breathing, while 31 (37.8%) of them had shallow, fast, irregular breathing during and after the attack. Six (7.3%) patients were coughing during the attack. Whispering immediately after the attack was recorded in 2 (2.4%) patients in the present study.

6) **Suggestion techniques and response to verbal commands**: In the present study, suggestion techniques to induce the PNES attack were used in 17 (20.7%) patients, and in all patients, they precipitated the typical attack, while in the remaining 65 (79.3%) patients, attacks occurred spontaneously. Forty-four (53.7%) patients comprehended the verbal commands given by the EEG technician or the relative during the attack like naming, showing tongue, raising the hand, etc. On the other hand, 38 (46.3%) patients did not respond to commands or to mild painful stimuli such as a pinch in the arm.

3.4. Proposal for the semiological classification of PNESs in adults

We could not classify 40–66% of our patients into any of the categories proposed by the various authors of previous studies (Table 1). The proposed definition/criteria of each category and the details of the semiology of PNESs to be included in each category are provided in Table 2. We tried to classify the semiological pattern of this series according to the proposed classification, and we could classify all the unclassified types. The mixed category was further subdivided into 9 types (Table 1). We found that 12 (14.6%) patients fit into the hypermotor type + affective/emotional behavior phenomena (Type VA), and 10 (12.2%) patients fit into the partial abnormal motor type + affective/emotional behavior phenomena (Type VD). We found 4 (4.9%) patients who had pure affective/emotional behavior phenomena, but this type of attack commonly occurred in combination with the other types, so it is logical to keep this as a separate category.

4. Discussion

The aim of this study was to evaluate the semiological characteristics of PNES attacks during video–EEG monitoring. Most of the patients
with PNESs are initially diagnosed to have epilepsy and are often exposed to AEDs which have potential negative consequences. A clear semiological pattern in PNESs is required to meet this need, and recently, many authors have tried to classify PNESs [4,11,12,16]. In the present study, the authors found that a large cohort of the patients could not be subclassified as per available classifications [11]. Therefore, an attempt was made to modify the existing classification in order to appropriately classify all the patients of this cohort.

On demographic and phenotypic assessments of this cohort with PNESs, it was found that the there was a slight female predominance [43 (53.2%)] which is similar to the results of previous studies [4,11,12]. There was an abrupt onset of the attacks in 60 (73.2%) of the cases in this study, which is contrary to the results of previous studies [1,17,18] which reported gradual onset of PNESs in adults. Previous studies have reported a subjective feeling of dizziness before the attacks in about 25% of their cases [19], though this was noted in a less-er number of patients in this cohort [n = 8 (9.8%)]. Benbadis et al. reported preictal pseudosleep in 55% of their PNES cases [20]. However, in the present study, preictal pseudosleep was noted only in 18 (22%) patients. It is difficult to explain this difference with the available information.

The motor manifestations, like asynchronous out-of-phase limb movements, were noted in 27 (32.9%) of our patients, which is within the range of 10–96% of the PNES cases reported by various authors [19–24]. Tremor and pelvic thrusting were found in 32 (39%) and 21 (25.6%) patients, respectively, in this cohort, similar to the results found in previous studies [4,25]. Gates et al. [21] proposed that forward pelvic thrusting is observed in PNESs, while backward pelvic thrusting is observed in epileptic GTCSs. There was a similar observation in this study in that forward pelvic thrusting was seen in 19 (23.2%) patients, while backward pelvic thrusting was seen in 2 (2.4%) patients. Previous studies have noted a high prevalence (9–44%) of vocalizations such as moaning, grunting, and screaming during an attack of PNESs [26,27]. In this study, 10 (12.2%) patients had vocalizations at the beginning of the attack, while 20 (24.4%) patients had vocalizations that started in the middle of the attack. Among these vocalizations, moaning was the most commonly observed [n = 11 (13.4%)]. This aspect has not been documented previously.

Habitual or stereotypic attacks are common in patients with PNESs ranging from 67 to 90% in various studies [1,11,19,28,29]. There were stereotypic/habitual attacks in 62 (75.6%) patients in this cohort. A previous study by Gulick et al. [28] had shown that hyperventilation can be present in up to 34% of the cases of PNESs. In the present study, hyperventilation was observed in 20 (24.4%) patients. We found that there are certain ictal characteristics which are more suggestive of PNESs than others. Table 4 shows these characteristics and their frequency in the present study.

There is no uniformity in the nomenclature and classification between different PNES types described in the different studies [11]. In routine clinical practice, physicians often have their own way of documenting and terming PNESs as pseudoseizures or psychogenic or functional seizures. Semiological variations range from an apparent coma-like state to violent thrashing movements of the whole body. A large number of the patients who present as having epilepsy actually have PNESs [5]. Few authors have tried to classify PNESs according to the semiological pattern, but there are a considerable overlap and differences between various subgroups [1,3–5,11,16].

Various EEG patterns have been described in PNESs [20]. Though interpretation of EEG in PNESs is difficult because of predominant high amplitude ‘bizarre’ artifacts, it was noted that the EEG recorded
during PNESs was either normal (e.g., dialeptic type of attacks and nonepileptic aura) or has varying muscle and movement artifacts similar to previous descriptions [11]. These “ictal” artifacts depend on the type of muscle involvement, the movement pattern of the body, and the electrode artifacts.

In the present study, we reviewed one of the largest series of adult patients with PNESs (n = 82) and analyzed their attacks recorded during the video–EEG monitoring. A previous study by Seneviratne et al. [11] classified the semiologies of the PNESs into 6 categories, namely, rhythmic motor type, hypermotor type, complex motor type, dialeptic type, nonepileptic aura, and mixed type [11]. The dialeptic type of attack (coma-like state, no response to external stimuli, and fall) and nonepileptic aura (subjective feeling of the attack without any external manifestations, dizziness before the attack, and ‘pressing button’ type) have been studied well and defined in various previous studies [23,18,30]. These categories seem to be pure categories of PNESs as they are not associated with coexistent epileptic seizures [11].

We tried to classify the various PNES attacks in this series according to classifications by some of the authors [1,4,11]; the details of which are provided in Table 1. However, we could not classify 40%–66% of our patients into any of the categories proposed by the authors [1,4,11]. When an attempt to classify the patients into these categories was made, a large number of the patients fell into the mixed category because they had attacks of varying combinations of the other five categories mentioned above. On detailed analysis of classification proposed by Seneviratne et al. [11], a considerable overlap between the characteristics of the semiologies among the categories was evident. For example, migratory complex bodily movements are included in the major motor subgroup of the rhythmic motor type as well as in the complex motor type, tonic-like movements are included both in the rhythmic motor type as well as in the complex motor type, or pelvic thrusting is kept in the complex motor type which may also be considered in the hypermotor type. Further, the hypermotor type was observed in a large number of patients in our series (28%). There is no clear mention about the rhythmicity and synchronicity during the attacks as well as the state of consciousness of the patients during the attack among the different categories, which is confusing. In several previous studies [25,26] and in the present series, we found that a large number of the patients presented with moaning, weeping, screaming, and grunting either alone or mostly in combination with other manifestations during the attack. Also, ictal characteristics like vocalizations and hyperventilation have not been given a place in the classification in spite of their common occurrence during a PNES.

Based upon the present analysis and considering the limitations of existing classification of the PNES attacks, we propose a classification based on the following five categories: I — abnormal motor response (IA: hypermotor and IB: partial motor); II — affective/emotional behavior phenomena; III — dialeptic type; IV — nonepileptic aura; and V — mixed pattern. We provide a definition and the criteria of each category and the types of the semiologies to be included in each category in Table 2.

The proposed classification has a potential to categorize PNESs which present in psychiatric settings as dissociative disorders. A recent report from the same center reported that dissociative convulsions and dissociative motor disorders accounted for 23% and 43% of all dissociative disorders, respectively, with a female preponderance, as in the current report [31]. There were features of anxiety, depression, and stress in about 65% of patients with PNESs in the current study, suggesting that these could be dissociative convulsions. The nature of attacks in the remaining 35% of PNESs remains elusive and could be considered as idiopathic or pseudoneurological.

The observations of this study need to be viewed with caution because of its retrospective data collection design. Recognition of the various semiological characteristics and focused classification system of PNESs is important for diagnosis and standardization. Though this proposed classification is based on a large cohort, further multicenter studies are required for improved subcategorization and validation with other studies. A consensus classification of PNES attacks is definitely the need of the hour for a systematic approach and better diagnosis and management.

Acknowledgment

We acknowledge the contributions of the staffs of the epilepsy monitoring unit (EMU), Department of Neurology. Last but not the least, we are grateful to the subjects for allowing us to carry out this study.

References

[27] Saygi S, Katz A, Marks DA, Spencer SS. Frontal lobe partial seizures causing poten-