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Association of Psychogenic Non-epileptic Seizures with Epilepsy in Children

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Abstract:

Background: Currently, society's concern for mental health is increasing, and children's mental health problems are gradually coming to the fore. Psychogenic non-epileptic seizures (PNES)is a seizure-like behavioural alteration of consciousness without physiological discharges that is common in the pre- and post-pubertal child population. Clinically, PNES are often differentiated from epileptic seizures by Electroencephalography (EEG). According to available studies, PNES seizures are often closely associated with emotional stress, family conflict, and shock. Methods: In this paper a literature search was conducted on PubMed with the key search term: pediatric psychogenic epilepsy and the selection range: last 10 years (2015-2025), resulting in 118 articles. Twelve of these articles with information on PNES comorbid seizures were reviewed, and three articles with publicly available past data were extracted, calculated and analysed for the probability of comorbid seizures or a history of seizures in a random sample of patients with PNES, and the data related to their associations were derived. Conclusion: There is an association between PNES and epilepsy in children, with a comorbidity rate of 20.32%, children with a history of epilepsy are more likely to have PNES, and children diagnosed with PNES are more likely to have epileptic seizures. In the future, the mental health of children with a history of epilepsy could be monitored to prevent the development of PNES in children, and the EEG of children with PNES could be monitored in advance for a tendency to discharge to prevent epilepsy.

Keywords: Epilepsy; Psychogenic non-epileptic seizures; Pediatrics.

1. Introduction

While current society is increasingly concerned about mental health, mental disorders in children remain a major public health problem [1]. Especially in the wake of global epidemics, where viruses and block-

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ades are infringing on and depleting children's physical and mental health to varying degrees, both psychologically and physiologically. Studies have shown that globally, one in seven children is affected by sequestration, and one in five adolescents between the ages of 15 and 24 shows depressive symptoms or diminished interest [2].

The lower the age of onset, the more developmental impact on the brain, as well as the frequency of neurological damage and later relapse. Research has shown that adolescence is a critical time for brain development, particularly in the prefrontal cortex, the area responsible for executive function, decision-making, and impulse control. Early episodes of mental illness may interfere with these developmental processes, leading to long-term cognitive and emotional problems. Adolescence and childhood are the core stages of brain development, personality shaping, and the formation of cognitive abilities and social resilience. If psychiatric disorders are not intervened in a timely manner, they can directly impair the development of brain function, leading to decreased learning ability, social disorders, deviations in self-cognition, and even creating hidden risks of relapse of psychiatric disorders, substance dependence, and self-injury and suicide in adulthood. Research on the pathogenesis of such diseases, early identification signals and intervention programmes can minimize the irreversible damage of the diseases to an individual's lifelong development.

Psychogenic non-epileptic seizures (PNES) is a disorder that is psychologically or emotionally related, but not associated with abnormal activity in the brain. PNES manifests itself primarily as epileptic-like somatic symptoms, but without neurophysiological abnormalities. Its core causes are closely related to psychological trauma, mood disorders, and imbalances in stress mechanisms, and are the result of a mind-body interaction. Unlike PNES, epilepsy is a brain disorder characterised by recurrent epileptic seizures. Epilepsy is characterised by abnormal neuronal discharges in the brain, and the seizures are recurrent and transient. The causes include muscle contractions, cortical disorders, brain tumours, head trauma, central nervous system infections and may be genetically linked. The onset of epilepsy is not limited to any age group, with children and the elderly being relatively common. Both seizures and PNES may manifest as paroxysmal, involuntary changes in behaviour, movement, autonomic function, consciousness or sensation [3].

Childhood PNES are common in the pre- and post-pubertal child population. Clinicians identify and differentiate psychogenic non-epileptic seizures from epileptic seizures often by EEG. PNES is not uncommon in children. Its pathogenesis is complex, involving biological, psychological and social factors.

Current research on PNES in children focuses on four main areas: diagnosis, risk factors, psychological problems and treatment.

Paediatric PNES is prone to being difficult to diagnose and prone to misdiagnosis due to the particular characteristics of the paediatric population. PNES are common in the paediatric population but are often overlooked. Diagnosing the condition may prove challenging, especially in those children with both epileptic and non-epileptic seizures [4].

At this stage, the diagnosis of PNES primarily requires a comprehensive assessment through the following steps:

The core of clinical diagnosis still relies on video electroencephalography (VEEG) as the gold standard. First, monitor to rule out organic epileptic seizures, then proceed with other physical examinations. This approach avoids overlooking other symptoms with a high degree of similarity that may be caused by underlying physical conditions. Secondly, through detailed observation and questioning to gather the patient's medical history, the clinician identifies the characteristic features that distinguish PNES from epileptic seizures. The doctor will then conduct a multidimensional assessment to identify psychosocial triggers. PNES often has more emotional triggers, such as stress, trauma, or anxiety, rather than a clear neurological abnormality like epileptic seizures. In terms of seizure duration, PNES episodes usually last longer than epileptic seizures, some exceeding 2 minutes. Ultimately, the diagnosis is further confirmed through multidisciplinary collaboration with the parents and the child.

There are also several studies looking at risk factors regarding PNES in children. The core of risk factors for PNES in children is the superimposed effect of physiological, psychological and environmental factors.

Physiologically, PNES is associated with a history of previous physical illness and neurological sensitivity. Elevated preoccupation with physical discomfort after illness and the psychological state of post-traumatic stress contribute to susceptibility to PNES. Additionally gender differences are a factor of concern.In the study by Yeom et al., they included 49 consecutive patients (38 girls and 11 boys) with a median age of 15.0 years by retrospectively analysing patients in the PNES clinic at Children's Healthcare of Atlanta from July 2019 to March 2020.They found that the median age of patients in the PNES clinic was 15.0 years. They ultimately found a predominance of female patients in the PNES clinic (female: male = 3.5: 1). A data highlights the gender-specific risk factors and susceptibility to PNES.

Psychosocial aspects, such as traumatic experiences, play an important role in the development of PNES and are one of the most central risk factors. Tong et al. found that

childhood traumas, such as abuse and neglect, were associated with an increased risk of PNES. They included 35 patients with PNES and 34 controls in their experiment, and after testing with a scale, they concluded that the incidence of childhood trauma was higher in patients with PNES compared to controls, and among these patients with PNES, early separation from parents was associated with more types of childhood trauma and emotional neglect (EN); older age and living in a rural area during childhood were associated with sexual abuse (SA). In addition, childhood SA and trauma accumulation were associated with current psychiatric symptoms. Childhood trauma and rural residence both associated with dissociative symptoms. It predicts an earlier onset of separation from parents PNES and a later onset of childhood SA. More severe dissociative symptoms associated with higher seizure frequency. There are also mood disorders and psychological stress that are important factors capable of triggering PNES.

Environmentally, children with PNES may have abnormalities in their family functioning and a lack of social support. Stress, conflict, poor communication, or lack of emotional support in the home environment may be associated with the development of PNES. Because children are unable to find someone to talk to or effective ways of releasing stress in environments such as the home and school. They are the ones who are prone to show emotional problems through somatic symptoms.

In addition to this, children with PNES are also at risk for many co-morbidities with other psychiatric disorders such as depression, anxiety, etc., which result in children with PNES facing a variety of psychological problems at the same time. These psychological problems affect both the quality of life of the child and potentially the outcome of PNES treatment. Therefore, comprehensive psychological assessment and intervention for children with PNES is crucial.

Currently, the main treatments for children with PNES include psychotherapy and pharmacotherapy.

Psychotherapy is designed to reduce episodes of PNES by helping the child to identify and manage underlying psychological problems. Psychological treatments effective for PNES include Cognitive Behavioural Therapy (CBT) and Eye Movement Desensitisation and Reprocessing (EMDR), among others.

Pharmacological treatments are often used to manage the co-morbid psychiatric disorders associated with PNES. Collaborative multidisciplinary management, including the cooperation of neurologists, psychiatrists, and psychotherapists, is considered to be the best approach for the treatment of PNES.

In conclusion, information on the true prevalence, clinical characteristics, treatments, and prognosis of PNES in the paediatric population is still relatively scarce, with limited sample sizes, and most of the available studies are retrospective analyses. Guidance on the assessment and management of PNES in children is relatively limited [5]. More relevant studies are needed to fill these gaps, and the results of the current study could play an important role in the future diagnosis, prevention, and treatment of PNES.

With such a high degree of similarity between PNES and epileptic seizures, both of them have some motor, sensory, and consciousness symptoms during seizures, and are also necessarily related. Another finding: there are many complex nerve conduction pathways in the brain, and seizures and PNES may involve the same or similar pathways. For example, the limbic system plays a complex role in both emotion regulation and epileptic seizures, and its influence involves multiple levels of neural circuits, neurotransmitters, and neuronal activity. The limbic system is activated when individuals experience intense emotional stress that triggers PNES, and certain types of epileptic seizures, too, often originate in limbic system structures, which may lead to similarities in symptomatic manifestations between the two.

2. Research Hypothesis

The author decided that PNES and epilepsy were related based on the similarity of their seizures. So further hypothesiswere made:

hypothesis 1: Whether people who have had epilepsy (with a history of epilepsy) have a higher likelihood of developing PNES, perhaps as a result of physiological changes or habitual changes in behavior, for example.

hypothesis 2: The likelihood of concurrent or future seizures was higher in those who had or had not had PNES.

3. Methods

This study followed the methodology of Hema Patel et al., by reviewing the past literature and counting the published data [6]. In this paper, a literature search was conducted on PubMed with the key search term: pediatric psychogenic epilepsy. The selection range: last 10 years (2015-2025), resulting in 118 articles. Twelve of these articles with information on PNES comorbid with seizures were reviewed, three articles with publicly available past data were extracted, and the probability of PNES patients with comorbid seizures (or history of seizures) in a random sample was extracted, counted, and the co-morbidity rate between PNES and epilepsy was calculated, and the mean and variance of co-morbidity rate were further derived.

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4. Results

Table 1. Summary of previous studies on PNES and typical co-morbidity rates [7-9]

Author Year	PNES Total Sample Size	History of epilepsy or combined number of seizures	Co-morbidity of PNES and epilepsy	Sample age
Anne S Hansen et al 2022	386	55	14.25%	5-17years
Szabó et al 2012	27	9	33.33%	children
Pillai 2012	39	39	100.00%	16 years or older
Kim 2012	143	32	22.38%	Paediatric patients only
Alessi 2013	42	17	40.48%	<18years
Akdemir 2013	34	0	0.00%	12-17years
Yi 2014	25	8	32.00%	8-19years
Dhiman 2014	56	9	16.07%	<18years
Plioplys 2014	55	16	29.09%	8.6-18.4years
Rawat 2015	44	0	0.00%	<16years
Sawchuk 2015	29	7	24.14%	Paediatric patients only
Yadav 2015	90	0	0.00%	<18years
Park 2015	141	16	11.35%	<18years
Say 2015	62	62	100.00%	11-18years
Cornaggia 2016	8	0	0.00%	Children and teenager
Valente 2017	53	21	39.62%	7-17years
Doss 2017	55	0	0.00%	8-18years
Madaan 2018	80	0	0.00%	6-16years
Li-Ping Zhang et al2021	88	5	5.68%	<18years

According to the chart 'PNES and epilepsy association rate' weighted by $\bar{x}_{\omega}$=20.32%, S_{ω}^2=0.0621.

The final co-morbidity of PNES with epilepsy in children was found to be approximately: 20.32% (see Table 1).

5. Discussion

This paper mainly focuses on the co-morbidity rate of PNES and epilepsy in children to explore the association between the two, so the following discussion on co-morbidity and co-morbidity rate:

Psychiatric disorders are common co-morbidities in patients with epilepsy [10]. The hypothesis that PNES, as a psychiatric disorder, is comorbid with epilepsy is supported.

The results of the co-morbidity study with other co-morbidities of epilepsy showed that the data obtained in the present study the 20.32% comorbidity rate is relatively high.

The investigation showed that the co-morbidity rate between epilepsy and anxiety was 19.2% [11]. The co-morbidity rate between epilepsy and depression was 33.3% [12]. This indicates that there is an association between PNES and epilepsy as co-morbidities in children.

According to the results of other researchers, the co-morbidity rate represents a high level, both for PNES in the epilepsy group and for epilepsy in the PNES group. In a study by Turner et al, the prevalence of PNES was 4.9 per100,000 per year. It is estimated that about 20% - 30% of patients referred to tertiary epilepsy centres for refractory seizures have both epilepsy and PNES [13].

In conclusion, there is an association between PNES and epilepsy in children, with a comorbidity rate of 20.32%, children with a history of epilepsy are more likely to have

PNES, and children diagnosed with PNES are more likely to have concomitant seizures.

6. Conclusion

This study shows that PNES and epilepsy are significantly associated in children, with an overall comorbidity rate of about 20.32%. According to the research, children with a history of epilepsy are more likely to develop PNES, and those who have been diagnosed with PNES are more likely to experience seizures now or in the future. These findings highlight how intricately neurological and psychological processes interact in paediatric populations. To prevent misdiagnosis and guarantee proper treatment, early detection and precise distinction of PNES from epileptic seizures are still essential. To reduce long-term developmental and psychological effects, thorough multidisciplinary evaluation and intervention are advised. To further understand the mechanisms behind this comorbidity and to offer more robust guidelines for clinical management, more extensive, prospective research are required.

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