Dual diagnosis of epilepsy and psychogenic nonepileptic seizures: Systematic review and meta-analysis of frequency, correlates, and outcomes

Dual diagnosis of epilepsy and psychogenic non-epileptic seizures: systematic review and meta-analysis of frequency, correlates and outcomes

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Key words: epilepsy, non-epileptic psychogenic seizure, comorbidity, dual diagnosis, dissociative seizure

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Abstract

Comorbid epilepsy and psychogenic non-epileptic seizures (PNES) represent a serious challenge for the clinicians. However the frequency, associations and outcomes of dual diagnosis of epilepsy and PNES are unclear.

The aim of the review was to determine the frequency, correlates and outcomes of a dual diagnosis.

A systematic review of all published observational studies (from inception to Dec 2016) was conducted to determine the frequency, correlates and outcomes of dual diagnosis. We included studies of individuals of any age reporting a dual diagnosis of epilepsy and PNES. All observational study designs were included with the exception of case-reports and case series with fewer than 10 participants.

The mean frequency of epilepsy in patients with PNES across all studies was 22% (95% confidence intervals [CI] 20 to 25%, range 0 % to 90 %), while the mean frequency of PNES in patients with epilepsy was 12% (95% CI 10 to 14%, range 1% to 62%). High heterogeneity means that these pooled estimates should be viewed with caution. A number of correlates of dual diagnosis were reported. Some studies delineated differences in semiology of seizures in patients with dual diagnosis vs. PNES or epilepsy only. However, most of the correlates were inconclusive. Only a few studies examined outcome in patients with dual diagnosis.

Dual diagnosis is common in clinical practice, especially among patients referred to specialized services, and requires careful diagnosis and management.

Key words: epilepsy, non-epileptic psychogenic seizure, comorbidity, dual diagnosis, dissociative seizure; psychogenic

1.Introduction

Psychogenic non-epileptic seizures (PNES) are genuinely experienced events resembling epilepsy but without the concomitant electrophysiological electrical activity[1]. The clinical presentation of PNES and epilepsy can be similar. However, approaches to their management are radically different. Epilepsy requires anticonvulsant therapy, in certain cases surgery and other non-pharmacological methods, while modern etiological models of PNES find that it has much in common with panic disorder and can benefit in a similar way from explanation and psychotherapeutic interventions [2].

In some cases, PNES and epilepsy coexist. According to different estimates, between 8% and 60% of patients with PNES also have epilepsy[3]. A number of factors could contribute to the development of PNES in epilepsy such as psychiatric comorbidities, cognitive dysfunction, the experience of unpredictable seizures and problems with social adaptation[4].

To our knowledge there is no systematic review exploring the frequency, associations and outcomes of comorbid epilepsy in patients with PNES and vice versa. These data are important for early identification of those who are at risk of the development of comorbid epilepsy and PNES and planning treatment. The aim of the review is to determine the frequency, correlates and outcomes of dual diagnosis of epilepsy and PNES.

2. Methods

The systematic review was undertaken following MOOSE guidelines[5] for meta-analysis of observational studies and reported following the PRISMA guidelines[6].

2.1. Search strategy and data extraction

Five databases were searched: MEDLINE, EMBASE, PsycINFO, CINAHL and AMED (from inception to 11 Dec 2016). The following search terms were used as free text or controlled vocabulary (i.e. medical subject headings, EMTREE) as appropriate for each database: 'epilepsy' AND 'seizure', 'attack', 'non-epileptic', 'psychogenic', 'dissociative', 'conversion', ‘functional’ (full details available in the supplementary file). Titles and abstracts of all references were screened by one author (YX) and full text articles were examined by another (MK) to determine whether they met the inclusion criteria. Further literature was sought through the reference lists of eligible studies (MK). Data extraction included region/country, recruitment site, study period, age, sample size, frequency of dual diagnosis, method of diagnosis and who made the diagnosis. One researcher (MK) extracted data. When abstracts from conferences were identified, we sought corresponding published journal articles. We reported data from the abstracts only if corresponding journal articles could not be identified. We judged articles to be from the same cohort if there was evidence

of overlapping recruitment sites, study dates, authorship and similar patient characteristics. We included all published observational studies reporting the frequency of people with dual diagnosis of epilepsy and PNES or associations of comorbid epilepsy and PNES as a primary or secondary outcome regardless of duration of the disease. All observational study designs were accepted with the exception of case-report and case series of fewer than 10 participants.

All studies were divided into high and low-quality groups. The studies were qualified as low-quality if they had either specific participant characteristic limits such as one sex, disabled, but not age, or convenience, selective or random sampling. Risk of bias was assessed using a 10-item assessment which reflected quality criteria for such studies [7].

Statistical analysis. Studies' reported frequency of comorbid epilepsy and PNES were pooled. We conducted quantitative synthesis and produced forest plots in Stata 13 using random effects analysis. Subgroup analysis was conducted based on the recruitment site (i.e. specialized centers; neuropsychiatry units, psychiatry departments, neuropsychology units; hospitals; populations based; databases) and study population (i.e. adults, adults in epilepsy surgery series, children, adults, veterans, intractable seizures, elderly). Statistical heterogeneity and consistency were assessed using the standard Q statistic, with $P < 0.05$ and I^2 .

3. Results.

The search results and selection processes are summarized in Figure 1. A total of 2773 references were identified, of which 175 full text articles were retrieved to assess for inclusion/exclusion and a total of 118 studies (122 reports) were considered eligible. Included papers contained data obtained from 17,478 people. Two studies were population-based [8 9], while the rest were hospital-based [1 3 4 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126]. In the latter, patients were recruited mostly from highly specialized epilepsy centers (tertiary hospitals, academic departments, comprehensive epilepsy programs - 112 of 118 studies). Sixty-nine studies were retrospective and 49 were prospective. Children were recruited in seven studies, three of which specifically included those with intractable seizures. In one study, patients with juvenile myoclonic epilepsy of different ages were included. One hundred and nine studies were restricted to adults, of which some were exclusively of specific subpopulations: elderly or veterans (n=7), surgical series (n=6), treatment resistant epilepsy (n=5), “mental retardation” (n=1) and traumatic brain injury (n=1). In 72 studies, patients with dual diagnosis were compared to those with PNES. In 21 studies, patients with dual diagnosis were compared with those with PNES and

with epilepsy. The method of diagnosis of epilepsy/PNES was video-EEG-monitoring (VEM) in 102 of 118 studies.

3.1. Frequency of dual diagnosis.

The frequency of epilepsy in patients with PNES varied from 0 % to 90 %, while the frequency of PNES in patients with epilepsy varied from 1% to 62%.

The pooled frequency of epilepsy among those with PNES was 22% (95% confidence interval [CI] 20 to 25%) (Fig. 2). The pooled frequency of PNES among those with epilepsy was 12%; 95% CI 10 to 14%) (Fig. 3). In both cases the level of heterogeneity (I^2) of included studies was high i.e. 96.5 and 92.7 % correspondingly, p=0,0001.

Meta-analysis of the data according to the site of recruitment yielded similar results. The pooled frequency of dual diagnosis varied from 2% (95% CI 1 to 4%) among those recruited from epilepsy surgery programs (3 studies, n=2872) up to 42% (95% CI 11 to 72%) among patients from (neuro)psychiatric departments and neuropsychology units (3 studies, n=161). In the two population-based studies, the pooled frequency of epilepsy among those with PNES (2 studies, n=833,527) was 14% (95% CI 4 to 23%) [9 8], and the frequency of PNES among those with epilepsy was 17% in a single study [9].

3.2. Demographic features.

There were no differences between those with dual diagnosis, PNES and epilepsy in aspects of age, age at disease onset, disease duration, sex, marital or educational status (see Table 1).

3.3. History details.

Patients' history of physical or sexual abuse, abuse in childhood, significant head trauma, and substance abuse, were similar among patients with dual diagnosis and PNES in all five [12 47 56 17 72] studies reported this. It did not differ among patients with dual diagnosis and epilepsy in two [17 72] out of three [17 72 26] studies.

3.4. Seizure characteristics and medication.

Non-epileptic seizure characteristics were assessed in ten studies with eight finding differences in semiology of seizures between those with PNES and dual diagnosis. Stiffening of the body (60% vs. 37% p>0.05) [12], opisthotonus (18.5% vs. 0%, p>0.03) [56], convulsive behavior (85% vs. 55.5% p>0.05) [47], right-hemibody PNES events (7% vs. 23%; p = 0.054)[77], autonomic symptoms/signs during the seizure (51.6% vs. 23.7% p=0.03)[27 99], postictal state (84% vs. 58% p=0.02)[12] were more common in patients with PNES than those with dual diagnosis. Total lack of responsiveness

(63% vs. 25% p<0.05) [18] and myoclonic seizure semiology (10% vs. 2%; p = 0.073)[77] were observed more often in patients with dual diagnosis than in those with PNES. Absence/staring seizures were less common in dual diagnosis in comparison to ES patients (9% vs. 41%; p = 0.003) [77].

The median seizure frequency was significantly higher in the patients with dual diagnosis than in those with PNES (for instance 30 (range 2 to 500) vs. 125 (range 1 to 1000) seizures per year [47]) in two [31 47] of three studies, but, in one study, this held only before the diagnosis of PNES [47].

As expected, patients with dual diagnosis had higher AED use than patients with PNES (5 studies [17 33 47 40 126]) and in one study lower AED use than in epilepsy [17]. Patients with PNES took more psychotropic drugs than AED in one study [33].

3.5. Miscellaneous clinical features.

Two studies explored possible association between dual diagnosis and medical comorbidities. One study (n=689), showed that patients with dual diagnosis in comparison to those with epilepsy more often smoked, suffered from pain, asthma, gastroesophageal reflux disease and migraine, while another one (n=188) [12] reported no association.

In one small study (n=20), the authors suggested an interesting way of classifying patients with dual diagnosis into three groups: i) resistant epilepsy with anxiety/depression and normal cognition, ii) learning difficulties and dependent personality, iii) comorbid cluster B personality disorders, anxiety disorders, psychic trauma and normal cognition. However, the small numbers meant this was only a hypothesis generating study [4].

3.6. EEG and neuroimaging

As expected, patients with dual diagnosis, in comparison to those with PNES, more often had abnormalities on EEG [109 33 61 91]. They were less susceptible to EEG induction procedures in one study[40]. Temporal lobe epilepsy was equally common in patients with epilepsy and dual diagnosis according to the biggest study of its kind (n=1488) [88], while smaller studies yielded conflicting results (Table 3).

3.7. Psychiatric comorbidity and neuropsychological features.

Most researchers used DSM-IV criteria for diagnosing psychiatric comorbidities [72 18 47], however there was no consistent approach across researchers to the assessment or categorization of neuropsychological features. At most, specific neuropsychological features were explored in no more than three studies making an overall summary difficult.

Generally researchers did not find a difference between PNES and dual diagnosis in psychiatric morbidity[56] [72] [47] or suicide attempts [18]. In three studies, patients with PNES and dual diagnosis experienced more behavioral problems than patients with epilepsy [84] [49] [27].

Compared to patients with PNES, patients with dual diagnosis more often experienced affective and personality disorders [26] [58], but less often had PTSD and dissociative disorder [58] [18] (Table 3). Using the Minnesota Multiphasic Personality Inventory patients with dual diagnosis, compared to patients with epilepsy, scored more highly on the 'hysteria' [17] [122] [86], 'lassitude-malaise' and 'mental dullness' scales [17]. On 'hypochondriasis' and 'depression' scales, they scored lower than PNES patients in one study [86].

Five studies [87] [72] [62] [91] [25] assessed cognitive function in patients with PNES and/or epilepsy and dual diagnosis and yielded conflicting results. Two out of four studies reported significant differences in cognitive functions between patients with PNES and dual diagnosis [87] [91], two found that cognitive changes could predict coexistence of PNES in epilepsy [62] [25], while one reported similar cognitive status for patients with dual diagnosis, PNES and epilepsy [72].

3.8. Employment and disability status

Employment status did not differ among patients with dual diagnosis and PNES in two studies [58] [47]. Disability status and length of medical care for the seizure disorder were analyzed in four studies, which yielded conflicting results. [26] [77] [17] [126].

3.9. Outcomes in patients with dual diagnosis.

Unfavorable outcomes in the dual diagnosis group were reflected in a greater number of emergency department visits in comparison to epilepsy [15] more frequent hospital visits[56] and rarer achievement of remission than in those with PNES [78].

Two studies demonstrated that detection of dual diagnosis could improve subsequent outcomes in those patients [56] [13]. After diagnosis of PNES, psychogenic events more often ceased in the dual diagnosis group as opposed to PNES group in one study (22% vs 58%) [56].

4. Discussion

Dual diagnosis is more frequent in this systematic review than previously reported [3]. This could be explained partly by the recruitment of patients in most studies from specialized epilepsy centers where complex and unusual cases concentrate. However, this relatively high frequency of dual diagnosis was also shown in two population-based studies suggesting that it is also common in overall populations of patients primarily diagnosed with epilepsy or PNES.

The lowest frequency of dual diagnosis was registered in surgical series (2%) which is probably explained by careful pre-surgical examination and exclusion of most of the patients with comorbid PNES. In contrast, the highest frequency of dual diagnosis was observed among patients referred to (neuro)psychiatry/neuropsychology units (42%), which probably reflects factors leading to referral to those services. This finding emphasizes the importance of considering the recruitment setting when looking at comorbidities.

Dual diagnosis was almost twice as frequent in the studies recruiting people with PNES than in the studies recruiting those with epilepsy. It could be that a certain proportion of the patients with epilepsy developed PNES, which then predominated in the clinical picture; such a pattern is common in our experience.

Demographic features of patients with dual diagnosis, PNES and epilepsy were similar. Despite some differences in individual studies, no consistent or specific semiological signs of dual diagnosis, were found which may differentiate it from patients who had PNES or epilepsy alone.

Varying findings on psychiatric comorbidities and neuropsychological correlates in patients with dual diagnosis reflect the clinical heterogeneity of this phenomenon. On the other hand, only some authors performed formal psychiatric evaluation to assess psychiatric comorbidities, whilst the rest used only psychometric scales, which could be considered as a limitation of those studies. There are several potential overlapping mechanisms of the development of PNES in epilepsy. These include a) anxiety and other psychiatric comorbidity arising from the experience of epilepsy; b) the way in which epilepsy may act as a 'symptom scaffold' on which is built a recurrent conditioned response to arousal[2] c) as an involuntary substitute symptom especially in an intellectually disabled population and after successful surgery for epilepsy. In the latter case reduction in epileptic seizure frequency leads to the develop of PNES driven by secondary gains such as caregiver attention or activity avoidance[4]. The development of PNES after epilepsy surgery could be not only "compensatory", but also a result of psychological stress associated with the operation [63] [60].

Very few studies assessed outcomes in patients with dual diagnosis. Some data showed that dual diagnosis predisposes patients to worse outcomes, but once the correct diagnosis is made, the number of events and number of AED is likely to decrease. This emphasizes the importance of timely diagnosis of PNES in epilepsy patients.

In clinical practice, the data suggest that patient with treatment-resistant epilepsy is at higher risk of developing of PNES, and vice versa. The dual diagnosis should be considered in the cases of the unexpected development of new seizure types or increase in their frequency. Correctly identifying dual diagnosis is typically harder than isolated PNES, and especially recording both types of events on VEM. In some cases, details from the patient's history can be misleading. For instance, mild

traumatic brain injury is a risk factor for the development of not only epilepsy, but also posttraumatic stress disorder and PNES [127]. On the other hand, although stress and adverse experience are considered established risk factors for the development of PNES in some individuals, they can also contribute to the development/exacerbation of epilepsy [128] [129].

This systematic review had several limitations. We included studies regardless how PNES, epilepsy and dual diagnosis were identified. In the majority of cases, the diagnosis was confirmed by VEM, whilst some authors used more relaxed diagnostic criteria. There was a high degree of heterogeneity between the studies which even a random effects meta-analysis may not have compensated for. Nonetheless we think the meta-analysis has some face validity in describing the published literature although summary values should be interpreted with caution. We also did not evaluate publication bias. There are likely to be other series of patients with ES, where PNES was not a focus of the study title or abstract but it is recorded as a comorbidity. We were not able to analyze studies in relation to the frequency of intellectual disability within individual studies, as this data was rarely available. Clinical experience suggests that patients with intellectual disability have a particularly high rate of dual diagnosis. Methodological limitations of some studies could also affect the dual diagnosis. For instance, provocative tests (verbal suggestion, saline injection) were used in 2 studies during VEM, and in some studies the 'criteria for epileptiform discharges' were not clearly described. None of the studies presented a priori power calculations for the sample size.

Future research could attempt to build on the categorization of patients with dual diagnosis of PNES and epilepsy under different subtypes depending on mechanisms of development and clinical features. Thus far, there is no work studying effective treatment of PNES in those with dual diagnosis as they tend to be excluded from clinical trials of AEDs . Clinicians working in this area tend to adopt a model of treatment, which focuses on helping patients, and their family identify individual seizure types and then treat accordingly. An additional element of therapy in those patients can involve a focus on understanding the hypothesized mechanisms of association described above. PNES are so common in certain patients with epilepsy (those with cognitive decline, affective disorders etc.) that it begs the question of whether pre-emptive education or psychological interventions are warranted and may be helpful in those high-risk groups?

5. Conclusion.

Dual diagnosis is relatively common among those diagnosed with PNES or epilepsy, especially in those who referred to specialized epilepsy centers. This indicates the importance of considering this comorbidity, not only in patients with PNES but also in a population with epilepsy. Future research should pursue potential mechanisms of the development of PNES in epilepsy, describe

individual risk factors and test possible interventions for the treatment and possibly early detection and prevention of the development of PNES in patients with epilepsy.

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.

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Fig. 1. PRISMA flow diagram for the systematic review process.

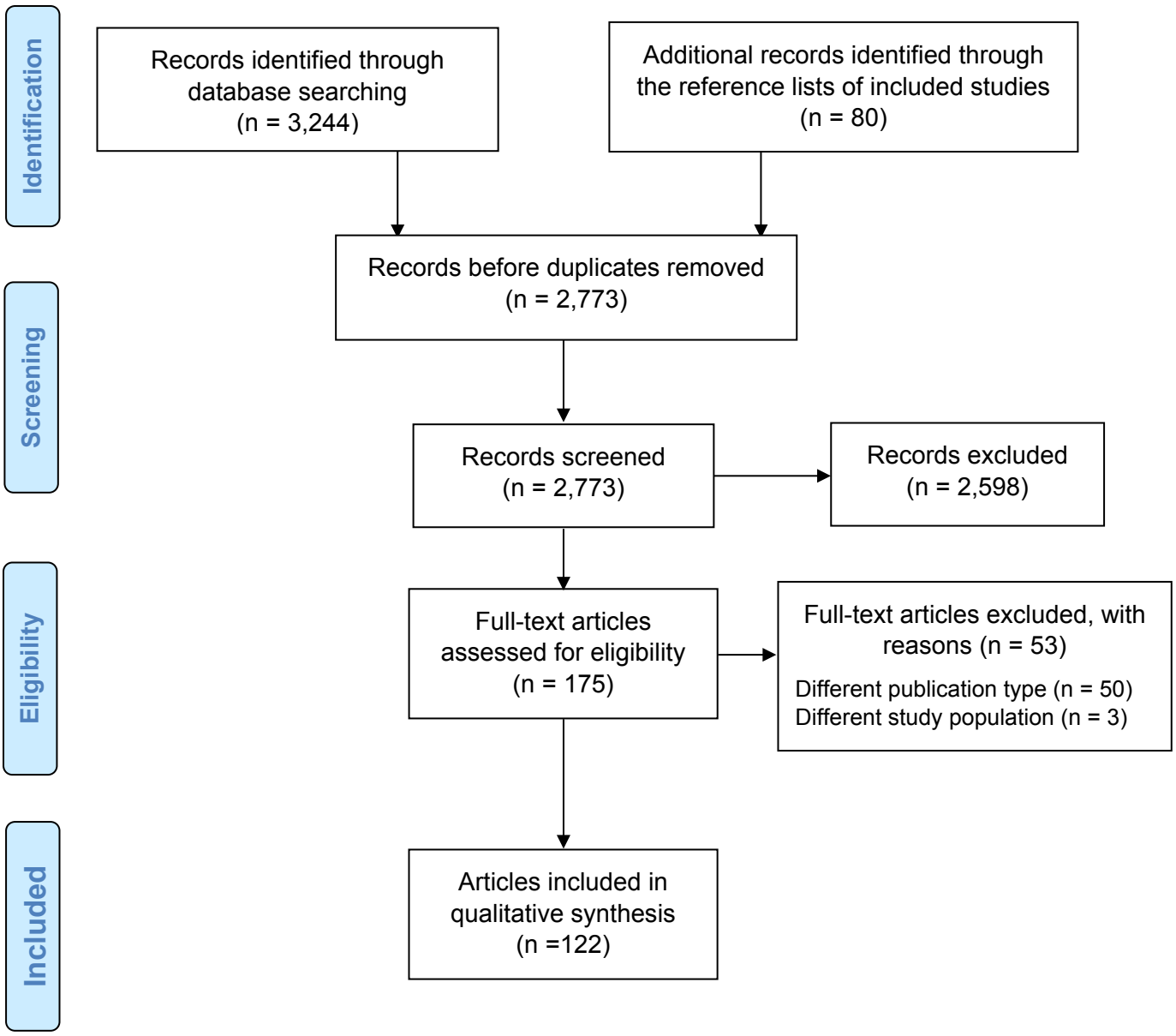

Fig.2. The frequency of epilepsy in patients with PNES

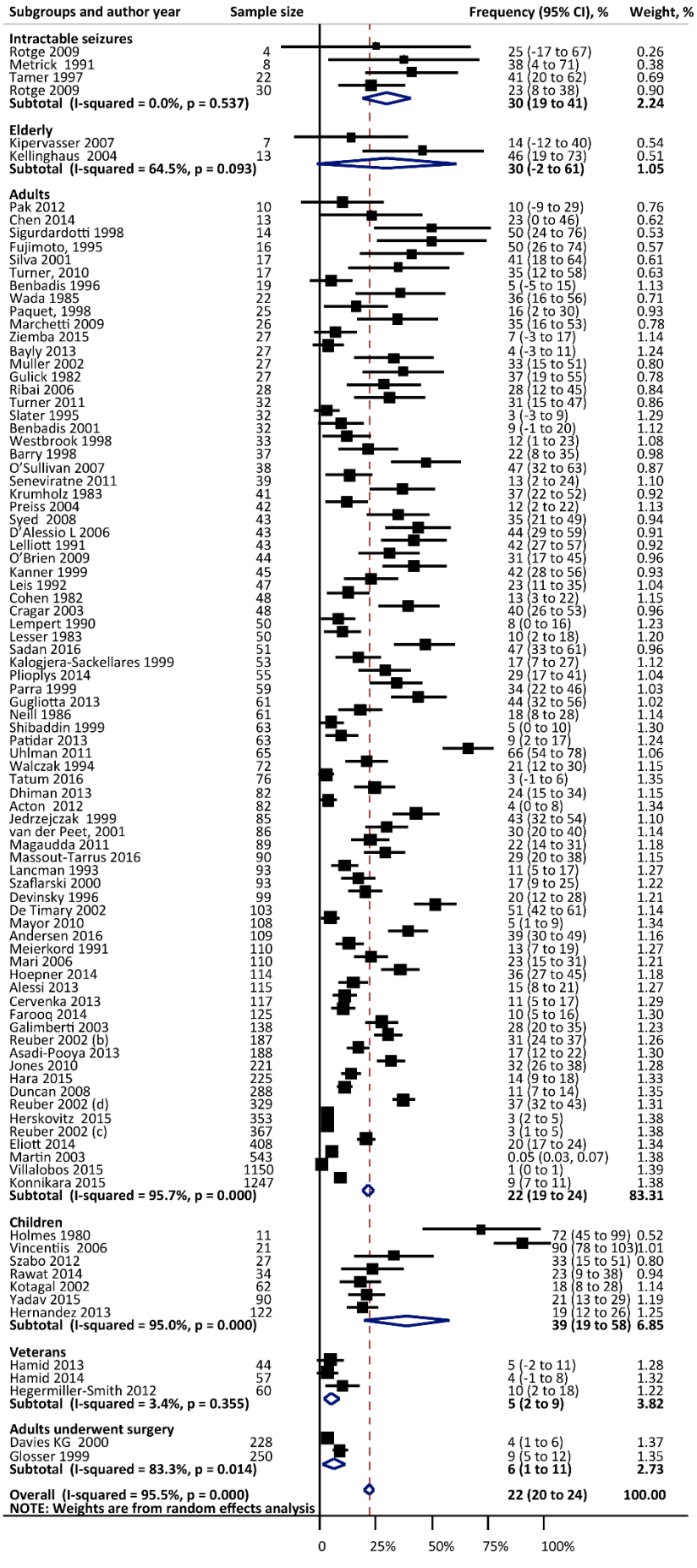

Fig. 3. The frequency of PNES in patients with epilepsy

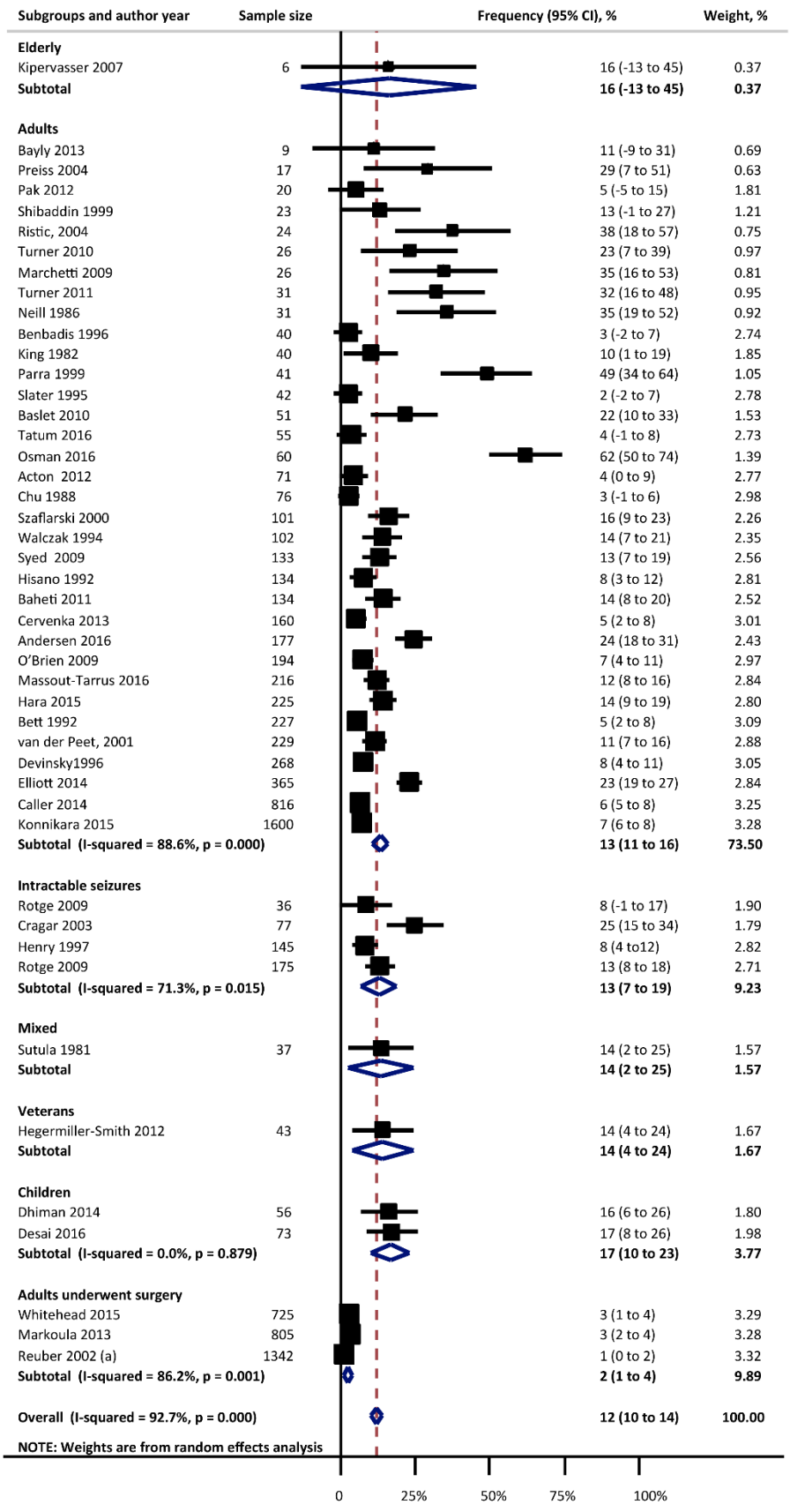

Table 1. Age, sex, age, disease duration and education level in patients with dual diagnosis, in comparison to those with PNES and/or ES

	D'Alessio 2006[18]	Mari 2006[40]	Kuyk 2003[58]	Asadi-Pooya 2013[12]	Hara 2015[31]	Hoepner 2014[33]	O'Sullivan 2017[47]	Sadan 2016[56]	Cragar 2003[17]	Eliott 2014[26]	Galimberti 2003[27]	Jovik 1998**[87]	Reuber 2003[62]	Markoula* 2013[89]	Konnikara 2015[88]	De Timary 2002[20]	Duncan 2008[25]	Turner 2011[72]	Wissel 2016[77]	Glosser 2016*[28]
Total N in the study	43	110	85	188	225	114	38	51	106	689	138	71	180	805	2738	103	288	66	138	250
N PNES	24	85	60	156		73	20	27	29	324	100	17	90		1488	50	257	22	46	228
N Epilepsy	-	-	-	-	194				58	281		30		779	1135			21	46	
N Dual	19	25	25	32	31	41	18	24	19	84	30	24	90	25	112	53	31	10	46	22
Age	<	<	>	=	=	=	=	=	= = ES	= ES	=	= = ES	= ES							
Age at onset		=	=		=	<	=	=	< = ES	= ES	> <ES	> <PNES	= ES			<	<	= = ES		>ES
Male	>	=	=	=		=	=	=	= = ES	< ES		= =ES	< ES	< ES	<	=				<ES
Disease duration	<PNES	>PNES			=	<PNES			<ES >PNES	= ES	= = ES	= = ES						=	>ES	
Education level		=	=	=	<PNES				=			> <PNES						=		=

< denotes those with dual diagnosis are younger than those with PNES or lower proportion of males among those dual diagnosis than those with PNES;
= Those with dual diagnosis are at same age/gender balance/disease duration/education level as those with PNES;
> Those with dual diagnosis older/more males than those with PNES;
< ES Those with dual diagnosis younger/fewer males/had shorter disease duration than those with ES;
= Those with dual diagnosis same age/gender balance/disease duration as those with ES,
>ES older/disease duration longer in those with dual diagnosis then in ES,
>PNES education level was higher/disease duration was shorter in patients with PNES than with dual diagnosis,
<PNES disease duration was shorter/education level was lower in patients with dual diagnosis than with PNES
* - included patients who had undergone resective epilepsy surgery, ** - studies recruiting children.

Table 2. Comparative analysis of epilepsy location in patients with dual diagnosis and epilepsy

Study	N/N*	Dual diagnosis	Epilepsy
Pillali 2012[59]	38/78	Frontal lobe	Temporal lobe
Konnikara 2015[88]	112/1488	No difference**	
Wissel 2016[77]	46/46	Right hemisphere	-
Reuber 2003[62]	90/90	No difference***	

*- number of patients with dual diagnosis/epilepsy

** - temporal lobe epilepsy was diagnosed in 79% (dual) and 75% (epilepsy) respectively

*** - more generalized epileptiform interictal changes were registered in patients with dual diagnosis

Table 3. Psychiatric comorbidities in patients with dual diagnosis, PNES and epilepsy

Study	Dual	PNES	Epilepsy	Findings
Sadan 2016[56]	24	27		PNES=dual diagnosis
Turner 2011[72]	10	22	21	ES=PNES=dual diagnosis
O'Sullivan 2007[47]	18	20		PNES=dual diagnosis
Wissel 2016[77]	46	46	46	ES<dual diagnosis; PNES< dual diagnosis depression, anxiety and stressor as a trigger of a seizure
Helmstaedter 2015 [84]	335			dual diagnosis >ES general behavioral problems
Owzcarek 2003[49]	152			dual diagnosis >ES anxiety and neuroticism
Ito 2009[57]	165			dual diagnosis >ES dissociation
Eliott 2014 [26]	84	32	281	dual diagnosis >PNES as depression, anxiety, bipolar disorder and personality disorder
Kuyk 2003[58]	25	60		dual diagnosis >PNES personality disorders; dual diagnosis <PNES somatoform disorder
D'Alessio 2006[18]	19	24		PNES=dual diagnosis

Table e–1: Description of search strategy.

Database	Search strategy	Limits
1) Medline	1. exp Epilepsy/ 2. epilep*.tw. 3. non-epilep* seizure*.tw. 4. non*epilep* seizure*.tw. 5. non-epilep* attack*.tw. 6. non*epilep* attack*.tw. 7. non-epilep* event*.tw. 8. non*epilep* event*.tw. 9. non*epilep* attack disorder*.tw. 10. non-epilep* attack disorder*.tw. 11. psychogenic seizure*.tw. 12. functional seizure*.tw. 13. pseudoseizure*.tw. 14. pseudoepilep* seizure*.tw. 15. Psychophysiologic Disorders/ 16. 1 or 2 17. or / 3-15 18. 16 and 17	Human
2) EMBASE	1. exp epilepsy/ 2. epilep*.tw. 3. psychosomatic disorder/ 4. non-epilep* seizure*.tw. 5. non*epilep* seizure*.tw. 6. non-epilep* attack*.tw. 7. non*epilep* attack*.tw. 8. non-epilep* event*.tw. 9. non*epilep* event*.tw. 10. non*epilep* attack disorder*.tw. 11. non-epilep* attack disorder*.tw. 12. psychogenic seizure*.tw. 13. functional seizure*.tw. 14. pseudoseizure*.tw. 15. pseudoepilep* seizure*.tw. 16. psychogenic nonepileptic seizure/ 17. 1 or 2 18. or / 3-15 19. 17 and 18	Human AND Exclude medline journals
3) CINAHL	S1. epilep* S2. MH Epilepsy+ S3. MH Psychophysiologic Disorders+ S4. non*epilep* seizure* S5. non-epilep* attack* S6. non-epilep* event* S7. non*epilep* event* S8. non-epilep* attack disorder* S9. psychogenic seizure* S10. S1 OR S2 S11. S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 S12. S10 AND S11	Human AND Exclude MEDLINE records AND Peer reviewed
4) PsycINFO	1. exp Epilepsy/ 2. epilep*.tw. 3. non-epilep* seizure*.tw. 4. non*epilep* seizure*.tw. 5. non-epilep* attack*.tw. 6. non*epilep* attack*.tw. 7. non-epilep* event*.tw. 8. non*epilep* event*.tw. 9. non*epilep* attack disorder*.tw. 10. non-epilep* attack disorder*.tw. 11. psychogenic seizure*.tw. 12. functional seizure*.tw. 13. pseudoseizure*.tw. 14. pseudoepilep* seizure*.tw. 15. Psychophysiologic Disorders/ 16. 1 or 2 17. or / 3-15 18. 16 and 17	Human
tw denotes title and abstract. terms end up with / are MeSH or EMTREE subject headings Searching was done on 11 Dec 2016.		