Epilepsy & Behavior 94 (2019) 78–81

Contents lists available at ScienceDirect

Epilepsy & Behavior

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

Performance of the International Index of Erectile Function tool in men with epilepsy

Elizabeth Dawson [a], Sonja E. Stutzman [b], DaiWai M. Olson [b,*,1], Ryan S. Hays [b]

[a] Department of Nursing, University of Texas Southwestern Medical Center, 5323 Harry Hines Blvd., Dallas, TX 75390-8855, United States of America
[b] University of Texas Southwestern Medical Center, 5323 Harry Hines Blvd., Dallas, TX 75390-8855, United States of America

ARTICLE INFO

Article history:
Received 24 October 2018
Revised 29 January 2019
Accepted 30 January 2019
Available online 17 March 2019

Keywords:
Epilepsy
Sexual dysfunction
Instrument development
Nursing
Medication adherence

ABSTRACT

Background: Approximately 18 million men suffer from some type of erectile dysfunction (ED), which is primarily attributed to age, comorbid health conditions, or medications. Men with epilepsy encounter all of these issues, yet ED literature and research in men with epilepsy is not yet robust. The purpose of this study was to test the utility of a validated ED screening tool in a population of men with epilepsy, as well as to assess additional parameters that may contribute to ED in this specific patient population. The secondary aim of this study was to determine the prevalence of noncompliance of epilepsy medication which may be due to a perceived relationship with ED.

Methods: This was a prospective pilot study to validate the International Index of Erectile Function (IIEF) in men with epilepsy. Enrolled men, between the ages of 18–45 years, were given an anonymous online survey that included the IIEF, as well as additional elements pertinent to their seizures and related treatment, including medication compliance.

Results: A total of 164 men completed the IIEF survey. Of these, 28% of respondents indicated the presence of ED, for which specific treatment might be warranted. The IIEF has 5 subscales; mean scores for each subscale are the following: ED 17.48/30, orgasmic function 6.2/10, sexual desire 6.72/10, intercourse satisfaction 8.98/15, and overall satisfaction 5.18/10. Four additional variables were added to specify the needs of men with epilepsy.

Conclusion: The IIEF can be administered to men with epilepsy. The addition of specific targeted questions in this patient population may also provide better understanding and facilitate an open dialog about how male sexual function relates to epilepsy and/or treatment thereof.

1. Introduction

Sexual dysfunction (SD) has been a known comorbidity for men with epilepsy for decades [1]. Although research varies widely on prevalence, it is estimated that 20% to 66% of men with epilepsy suffer from some degree of SD, including erectile dysfunction (ED) and decreased sexual interest [2–5]. While the percentage of men with epilepsy and SD is high, clinicians may be reluctant to discuss libido and SD with their patients. Only 25% of clinicians reported being knowledgeable of epilepsy-induced and antiepileptic medication-induced SD [6].

The International Index of Erectile Function (IIEF) is an accepted tool to measure the degree of ED in the general male population [7]. However, the IIEF has not been validated in the population with epilepsy, and men with epilepsy have specific features that may not be captured by the IIEF tool [8]. Few studies provide connections between antiseizure medication compliance and ED in men with epilepsy. The purpose of this study was to test the utility of a validated ED screening tool in a population of men with epilepsy, as well as to assess additional parameters that may contribute to ED in this specific patient population. The secondary aim of this study was to explore the efficacy of this instrument to determine the prevalence of noncompliance with antiseizure medication.

2. Background

Various forms of ED occur in 18% of all males, with an estimate of 18 million men managing some form of SD/ED [9]. Erectile dysfunction is 65% higher in men over the age of 70 years, and thus, age has become a significant focus of study for men with ED. But, certain medical diagnoses and/or medications also confer an increased risk of ED. For example, the literature suggests that approximately half of men over the age of 20 years that have been diagnosed with cardiovascular disease, diabetes, obesity, hypertension, and prostate enlargement may suffer from ED [9]. Numerous pharmacologic agents including antipsychotics, cardiovascular agents, cytotoxic agents, diuretics, hormones and

* Corresponding author.
E-mail address: DaiWai.Olson@UTSouthwestern.edu (D.M. Olson).
[1] Dr. Olson is the Editor of Journal of Neuroscience Nursing.

https://doi.org/10.1016/j.yebeh.2019.01.044
1525-5050/

hormone-active agents, immunomodulators, and tranquilizers have all been shown to contribute to ED [10].

Medication noncompliance is inversely associated with medication adherence [11]. When a medication is prescribed that increases the occurrence of ED, there is an increased potential for poor medication compliance. Furthermore, the presence or absence of ED may not be routinely covered during clinic visits. Hence, patients may be tempted to become noncompliant with specific medical therapies and not inform their providers; patients may not adequately understand the impact such a decision may have on their overall health.

The IIEF is a validated self-report scale that assesses the degree of SD in the general male population [7]. The IIEF is mostly used with older males, especially those with diabetes and hypertension. The IIEF has been used to examine SD in men with neurological diseases such as multiple sclerosis [12]. But the IIEF has not been validated in men with epilepsy, and men with epilepsy are more likely younger and have different biopsychosocial profiles from the general public. In order to address the gap in knowledge that exists regarding ED in men with epilepsy, the IIEF was administered to men with epilepsy in this study; additionally, selected sexual characteristics, seizure characteristics, and antiseizure medication compliance were assessed.

3. Methods

This prospective pilot study explored the validity of the IIEF with males that have been diagnosed with seizures, as well as the psychometrics of additional variables specific to the population with epilepsy. Face validity is a subjective assessment of an instrument; field experts (those familiar with epilepsy and or SD/ED) evaluate whether a measure appears as though it would provide meaning. Items may be added or withdrawn from an intended instrument based on feedback from face validity assessment. Construct validity refers to how well an instrument provides a measure that represents the intended variable [13]; in this case, how well IIEF plus additional epilepsy-specific items measure SD in men with epilepsy.

The IIEF was developed in 1997 as a 15-item self-report survey with the intention of assessing erectile function in men in the general population. There are five specific domains assessed across the 15-items: erectile function, orgasmic function, sexual desire, intercourse satisfaction, and overall satisfaction. To establish face validity, the IIEF was shared and discussed with staff (nurse, advance practice provider, and two faculty physicians) in the epilepsy monitoring unit and then reviewed by PhD consultants not working with patients with epilepsy. There were 8 additional epilepsy-specific items (recommended by epilepsy practitioners) that were added to the IIEF which included: self-reported type of seizure, length of time of seizure diagnosis, length of time since last seizure, medications taken for seizure management, missing doses of medication due to sexual feelings, amount of sexual activity, last attempt to achieve an erection, and percentage of time the person has been able to achieve an erection (Table 1).

The IIEF survey was made available to men between the ages of 18 and 45 years, who had a diagnosis of epilepsy. Participants were asked to anonymously complete an online survey housed in REDCap™. The study was approved by the University Institutional Review Board prior to enrollment. Men who were admitted to the epilepsy monitoring unit at a large urban academic hospital were provided with information to complete the anonymous survey. Men were also encouraged to share the questionnaire with others that had been diagnosed with epilepsy. Subjects were additionally recruited from our affiliated neurological outpatient clinic and online resources (e.g., Facebook groups aimed at supporting persons with epilepsy). The study was reviewed and approved by the University Institutional Review Board. A statement of consent was provided with the survey to indicate that voluntary completion of the survey implied consent.

Table 1
Epilepsy-specific items added as additional questions.

A	Type of seizure you experience	Focal motor onset (simple partial) Focal nonmotor onset (complex partial) Generalized onset motor (Grand mal) Generalized onset nonmotor (absence) Unknown onset
B	What medications are you taking?	(Participants provided with list of medications and instructed to select all that apply)
C	How long have you had epilepsy?	Less than 1 year 1 to 5 years Greater than 5 years
D	When was your last seizure?	Less than a week ago In the last month In the last year Greater than a year
E	Have you missed a dose of your seizure medication because of how if made you feel sexually?	Yes or No
F	In the last 6 months, have you had sexual activity at least once monthly?	Yes or No
G	I was able to keep an erection ____% of the time	(Response options 0–100% at 10% increments)
H	How often were you able to get an erection during sexual activity	No sexual activity Almost never or never A few times (less than half the time) Sometimes (about half the time) Most times (more than half the time) Almost always or always

3.1. Procedures of study

The primary outcome of the study is the validation of the IIEF with males diagnosed with epilepsy. The IIEF was not altered for this study, but the 8 items listed above were added to specifically address the population with epilepsy. These questions were added after a rigorous literature review and peer-review in order to better assess the needs of this particular patient population. The survey items were presented to experts in the field of epilepsy and neurological disease (physicians, PhD prepared scientists, and nurses who provide direct care to patients with epilepsy) prior to the participants completing the survey.

All data were downloaded from RedCap™ and entered into SAS 9.4 for analysis. Initially, measures of central tendency were used to describe responses to each of the questions individually. Associations were examined using the appropriated parametric or nonparametric statistic. Factor analysis of the survey results were completed using PROC FACTOR. Estimate of communality was calculated using squared multiple correlations between variables and a Scree plot was created to determine the number of factors to retain.

4. Results

Of 164 participants, 157 identified at least one form of sexual orientation; 132 (80%) identified as heterosexual, 20 (12%) as homosexual, and 5 (3%) bisexual (Table 2). There were 15 men (9%) who identified self-satisfaction as their preference to reach an orgasm: 8 identified as heterosexual, 1 as bisexual, and 6 did not specify a sexual identity. All subjects confirmed that they were between the ages of 18 and 45 years. The most common type of seizure reported was generalized onset motor (65%), followed by focal nonmotor onset (55%), generalized onset nonmotor (28%), focal motor onset (13%), and unknown onset (7%). As shown in Table 4, only 10 (6.1%) men were on monotherapy; the most common monotherapy medications were levetiracetam (4), lamotrigine (3), and valproate (2).

When interpreting the IIEF subscales, scores suggested higher than anticipated levels of dysfunction. A recent consensus statement supports that the rate of SD in men under 50 is <20% [14]. Participants in this study were aged 18–45 years and scored an average of 17.48

Table 2
Demographics.

Variable	Frequency (%)
Sexual preference[a]	
Heterosexual	132 (80.5%)
Homosexual	20 (12.2%)
Bisexual	5 (3.1%)
Self-satisfaction	15 (9.2%)
Seizure type[a]	
Focal motor onset	22 (13.4%)
Focal nonmotor onset	91 (55.4%)
Generalized onset motor	107 (65.24%)
Generalized onset nonmotor	46 (28.1)
Unknown	11 (6.7%)

[a] Not mutually exclusive answers.

(standard deviation [sd] = 6.56, max score = 30) on the domain of Erectile Function, 6.20 (sd = 2.4, max score = 10) on the domain of Orgasmic Function, 6.72 (sd = 1.93, max score 10) on the domain of Sexual Desire, 8.98 (sd = 3.48, max score = 15) on the domain of Intercourse Satisfaction, and 5.18 (sd = 2.23, max score = 10) on the domain of Overall Satisfaction (Table 3). Notably, in patients without epilepsy, IEEF summary scores <14 for erectile function indicate respondents could benefit from medication, and 46 (28%) of our sample scored <14 on this domain.

To better understand how the IIEF factors and epilepsy-specific questions are relevant to this population, a factor analysis was completed using the 8 prespecified epilepsy-specific items. Principal component analysis with varimax rotation resulted in a Kaiser–Meyer–Olkin measure of 0.92 (superb) and 5 components had eigenvalues >1 and were retained [15]. Three of the epilepsy-specific items met criteria for inclusion in one of five new factors. The new items included were the following: A) Have you missed a dose of your seizure medication because of how it made you feel sexually? B) In the last six months, have you had sexual activity at least once monthly? C) When is the last time you attempted to achieve an erection? The five factors that were significant were the following: Erectile Ability, Overall Satisfaction, Sexual Desire, Compliance, and Initiation of Erection (Table 3). The factor of sexual desire factors matched the original scoring of the IIEF.

5. Discussion

Men with epilepsy are routinely prescribed antiepileptic medications that might negatively affect sexual function by lowering hormone levels, hormone ratio, and gonadal efficiency [2,16,17]. Noncompliance with epilepsy medication can lead to complications such as breakthrough seizures, risking associated injury, or even death. Although these medications are necessary to treat the seizures, their impact on sexual function may be minimized within a clinical setting. Additional psychosocial factors, beyond the potential side effects of antiseizure medication, may also contribute to ED in men with epilepsy; for example, patients with seizures have higher rates of anxiety and depression, and men with epilepsy have been shown to have higher rates of psychosocial pressures that can lead to hyposexuality [2]. The majority of the patients in our study were on more than one antiseizure medication (only 6.1% of survey respondents were on monotherapy); it is possible that our sample reflects a bias towards men with more severe epilepsy. Thus, men with less severe or refractory epilepsy may have higher or lower rates of ED.

Treatment-related ED has become an important consideration for understanding medication compliance and adherence in a variety of medical conditions, including heart disease and diabetes. However, few studies have focused on how treatments affect men with epilepsy. This study used the IIEF, plus additional disease specific questions to address sexuality, seizure characteristics, and medication compliance as it related to ED in men with epilepsy. The epilepsy-specific questions provide data to link the need for open communication between providers and patients regarding perceived epilepsy medication side effects (e.g., sexual function) and medication compliance or adherence [18]. The results of our study extend the findings of Buelow, Miller, & Fishman [18] that there is a need to identify key topics for discussion when providing care to patients with epilepsy.

Perfect validity is theoretical, and each instrument is evaluated for how well it performs as a measure of the concept or variable for which it is designed [13]. Our findings indicate that there are additional variables that should be considered when addressing ED and medication compliance in men with epilepsy. Men with epilepsy may be prone to ED, and such may increase the tendency to be nonadherent with their antiseizure medication. The results from the principal component factor analysis support the hypothesis that the IIEF and additional questions provide insight in this sample. Although not powered to examine prevalence, the early findings hint that SD rates (28%) are higher in men with epilepsy compared with men of similar age [19]. However, the results are limited to this sample and may not be generalizable. The results support that this tool may potentially provide practitioners with a means to identify individuals at higher risk for SD/ED. Providers need to be aware of this possibility and encourage an open dialog to address the needs of men with epilepsy.

5.1. Limitations

This was a pilot study that was underpowered to determine all of the associations between epilepsy treatments and their effects on SD. Because of the survey design, the seizure types were based on self-reports and not objectively verified; additionally, while the survey was intended for men with epilepsy, it is possible that patients with psychogenic nonepileptic seizures were included in the survey. The greatest threat to validity is reliability and significantly larger samples of men with epilepsy may increase or decrease the reliability of the IIEF plus disease-specific items for use in this population. Men were provided with a link to the survey and encouraged to share this link with other men who had epilepsy (snowball recruitment). The inability to know how many men opted to not complete (participate in) the survey is a

Table 3
Comparing mean scores for IIEF factors with and without additional epilepsy questions (n = 164).

	Factor (corresponding question number)	Maximum possible score	Study sample mean (s.d.)
IIEF questions only *(original factors)*	Erectile Function (IIEF Q 1,2,3,4,5,15)	30	17.48 (6.56)
	Orgasmic Function (IIEF Q 9,10)	10	6.20 (2.40)
	Sexual Desire (IIEF Q 11,12)	10	6.72 (1.93)
	Intercourse Satisfaction (IIEF Q 6,7,8)	15	8.98 (3.48)
	Overall Satisfaction (IIEF Q 13,14)	10	5.18 (2.23)
IIEF plus epilepsy-specific items	Erectile Ability (IIEF Q 4,5,7,8,9)	25	14.24 (5.98)
	Overall Satisfaction (IIEF Q 10,13,14,15)	20	11.08 (4.16)
	Sexual Desire (IIEF Q 11, 12)	10	6.72 (1.93)
	Compliance (ESI Q A, B)	5	1.17 (0.67)
	Initial Erection (IIEF Q 1,2,3; ESI Q C)	19	10.77 (2.94)

IIEF — International Index of Erectile Function; Epilepsy-specific item; Q — question number.

Table 4
Antiepileptic drug (AED) use by respondents.

	Total number of men in this sample			
Medication name	Taking each medication	Monotherapy using	Dual therapy including	≥3 medications including
Sodium valproate (Depakote)	89	2	19	68
Levetiracetam (Keppra)	66	4	17	45
Clobazam (Onfil)	38	0	8	3
Lacosamide (Vimpat)	38	1	8	29
Phenytoin (Dilantin)	38	0	5	33
Lamotrigine (Lamictal)	36	3	16	17
Carbamazepine (Tegretol)	29	1	6	22
Clonazepam (Klonopin)	27	0	0	27
Oxcarbazepine (Trileptil)	20	0	4	16
Topiramate (Topamax)	16	0	4	12
Acetazolamide (Aptium)	13	0	3	10
(Cannabidiol CBD oil)	10	0	2	8
Zonisamide (Zonegram)	9	0	1	8
Eslicarbazepine (Aptiom)	7	0	0	7
Ethosuximide (Zarontin)	6	0	0	6
Phenobarbital	6	0	1	5
Primidone (Mysoline)	3	0	0	3
Gabapentin (Neurontin)	2	0	1	1
Perampanel (Fycompa)	2	0	0	2
Pregabalin (Lyrica)	2	0	0	2
Rufinamide (Banzel)	2	0	0	2
Vigabatrin (Sabril)	2	0	0	2
Stiripentol (Diacomit)	1	0	0	1
Tiagabine (Gabitril)	1	0	0	1
Unknown/not specified	6	1	1	4

limitation. The decision to retain factors based on the Eigenvalue >1 rule, while common, is debatable, and alternative analytical techniques may retain more or fewer factors [15,20]. Three Mood questionnaires were not included as part of this study, and it is possible that the self-reported SD correlating with antiseizure medications was actually an epiphenomenon related to depression or anxiety. Future studies could correlate objective electroencephalography (EEG) findings with the patients' self-reports of seizure types to determine if there is a difference in sexual function between men with psychogenic nonepileptic seizures versus epileptic seizures. Future studies should also correlate SD in men with epilepsy with levels of mood disorder, seizure frequency, complexity of seizure, specific seizure location, types of antiepileptic drugs, and number and type of antiseizure medications used.

6. Conclusion

This study demonstrated that the IIEF can be administered to men with epilepsy. However, this study highlights that specific factors related to compliance of medication and ED may not be captured via the IIEF in this population. The addition of targeted questions in this population may shed light on a patient's rationale for noncompliance with antiseizure therapy, thereby affording opportunity for providers to address patient behaviors that may worsen the patient's overall health and to identify and treat comorbid issues that impact quality of life.

Funding

There was no funding accepted for this study.

Conflict of interest

The authors declare no other real or potential conflicts of interest.

References

[1] Luef G, Madersbacher H. Sexual dysfunction in patients with epilepsy. Handb Clin Neurol 2015;130:383–94.
[2] Hamed SA, Hermann BP, Moussa EM, Youssef AH, Rageh TA, Elserogy YE, et al. Evaluation of penile vascular status in men with epilepsy with erectile dysfunction. Seizure 2015;25:40–8.
[3] Lue T, Tanagho E. Physiology of erection and pharmacological management of impotence. J Urol 1987;137:829.
[4] Pavone C, Giacalone N, Vella M, Urso L, Zummo L, Fierro B. Relation between sexual dysfunctions and epilepsy, type of epilepsy, type of antiepileptic drugs: a prospective study. Urologia 2017;84:88–92.
[5] Herzog AG, Drislane FW, Schomer DL, Pennell PB, Bromfield EB, Kelly KM, et al. Differential effects of antiepileptic drugs on sexual function and reproductive hormones in men with epilepsy: interim analysis of a comparison between lamotrigine and enzyme-inducing antiepileptic drugs. Epilepsia 2004;45:764–8.
[6] Kaufman KR, Wong S, Sivaraaman K, Anim C, Delatte D. Epilepsy and AED-induced decreased libido — the unasked psychosocial comorbidity. Epilepsy Behav 2015;52:236–8.
[7] Rosen RC, Riley A, Wagner G, Osterloh IH, Kirkpatrick J, Mishra A. The international index of erectile function (IIEF): a multidimensional scale for assessment of erectile dysfunction. Urology 1997;49:822–30.
[8] Yogarajah M, Mula M. Sexual dysfunction in epilepsy and the role of anti-epileptic drugs. Curr Pharm Des 2017;23(37):5649–61.
[9] Selvin E, Burnett AL, Platz EA. Prevalence and risk factors for erectile dysfunction in the US. Am J Med 2007;120:151–7.
[10] Rew KT, Heidelbaugh JJ. Erectile dysfunction. Am Fam Physician 2016;94:820–7.
[11] Dibonaventura M, Gabriel S, Dupclay L, Gupta S, Kim E. A patient perspective of the impact of medication side effects on adherence: results of a cross-sectional nationwide survey of patients with schizophrenia. BMC Psychiatry 2012;12:20.
[12] Odabas FO, Gumus H, Akkurt HE, Uca AU, Yilmaz H. The assessment of sexual dysfunction in male patients with multiple sclerosis. Noro Psikiyatr Ars 2018;55:349–53.
[13] Buelow JM, Hinkle JL, McNett M. Reliability and validity for neuroscience nurses. J Neurosci Nurs 2016;48:238–41.
[14] McCabe MP, Sharlip ID, Lewis R, Atalla E, Balon R, Fisher AD, et al. Incidence and prevalence of sexual dysfunction in women and men: a consensus statement from the Fourth International Consultation on Sexual Medicine 2015. J Sex Med 2016;13:144–52.
[15] Field A, Miles J. Exploratory factor analysis. In: Field A, Miles J, editors. Discovering statistics using SAS. Los Angeles: Sage; 2012. p. 541–93.
[16] Verrotti A, Mencaroni E, Cofini M, Castagnino M, Leo A, Russo E, et al. Valproic acid metabolism and its consequences on sexual functions. Curr Drug Metab 2016;17:573–81.
[17] Herzog A, Drislane F, Schomer D, Pennell P, Bromfield E, Dworetzky B, et al. Differential effects of antiepileptic drugs on sexual function and hormones in men with epilepsy. Neurology 2005;65:1016–20.
[18] Buelow J, Miller W, Fishman J. Development of an epilepsy nursing communication tool: improving the quality of interactions between nurses and patients with seizures. J Neurosci Nurs 2018;50:74–80.
[19] Rastrelli G, Maggi M. Erectile dysfunction in fit and healthy young men: psychological or pathological? Transl Androl Urol 2017;6:79–90.
[20] Gaskin CJ, Happell B. On exploratory factor analysis: a review of recent evidence, an assessment of current practice, and recommendations for future use. Int J Nurs Stud 2014;51:511–21.