Epilepsy & Behavior 101 (2019) 106587

Contents lists available at ScienceDirect

Epilepsy & Behavior

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

Validation of a Georgian version of the Neurological Disorders Depression Inventory for Epilepsy (NDDI-E)

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ARTICLE INFO

Article history:
Received 12 August 2019
Revised 20 September 2019
Accepted 20 September 2019
Available online xxxx

Keywords:
NDDI-E
Georgian version
Epilepsy
Depression screening

ABSTRACT

Introduction: This study aimed to validate a Georgian version of the Neurological Disorders Depression Inventory for Epilepsy (NDDI-E). The distribution of psychiatric disorders was assessed among patients with epilepsy.
Methods: One hundred and thirty consecutive adult patients with epilepsy completed the NDDI-E and the Beck Depression Inventory (BDI). All patients were further assessed by a qualified psychiatrist.
Results: In 31 (23.8%) patients, a diagnosis of major depression was revealed. The internal consistency of the NDDI-E was 0.695. Receiver operating characteristics (ROC) showed an area under the curve of 0.975. A cutoff score of ≥16 resulted in a sensitivity of 0.90 and a specificity of 0.939. The screening questionnaire showed a significantly positive correlation with BDI scores (Spearman's rho — 0.684), indicating good concurrent validity.
Discussion: The Georgian version of the NDDI-E is a reliable tool for the detection of depressive disorders in individuals with epilepsy.

1. Introduction

Psychiatric and behavioral disorders, which are common in people with epilepsy (PWE), have gained increasing attention during the last decade. Despite diagnostic difficulties, many recent epidemiological studies have found that the prevalence of depression and anxiety is higher in PWE than in people without epilepsy [1–3]. Major depressive disorder (MDD) is a common psychiatric comorbidity among patients with epilepsy [4]. Major depressive disorder shares many neurobiological characteristics with epilepsy and interferes with quality of life more than the seizures themselves [5–7]. Moreover, depression is the leading risk factor for suicide in PWE [4]; however, symptoms of depression are often undiagnosed and undermanaged in PWE, which causes ineffective treatment for epilepsy. Therefore, a reliable screening tool for the timely identification and correct medical management of depression is an important prerequisite for successful outcomes in epilepsy treatment [8].

A brief, self-rating screening instrument, hereafter called the Neurological Disorders Depression Inventory for Epilepsy (NDDI-E) [9], was developed by Gilliam and colleagues and includes six items rated in a Likert scale from 1 to 4. The NDDI-E has been successfully translated and adapted to different languages, and in all translations showed acceptable internal consistency, sensitivity, and specificity [10–12]. The objective of present study was to validate the translation of the original version of the NDDI-E into a Georgian version for use in patients with epilepsy.

2. Methods

2.1. Participants

A total of 130 consecutive adult outpatients diagnosed with epilepsy and admitted to tertiary care at the Epilepsy Prevention and Control Centre of the Institute of Neurology and Neuropsychology (INN) located in Tbilisi (Georgia) were included in this study.

The diagnosis of epilepsy was established through a multidisciplinary evaluation that included epileptologists, neuropsychologists, and clinical electrophysiologists. In all cases, a standard electroencephalogram (EEG) investigation with 10–20 internationally accepted standards was performed. Seizure type and epilepsy syndromes were defined according to classifications from the International League Against Epilepsy [13].

Patients with serious mental disorders that could not properly fill out the questionnaire were not included in the study. The study protocol was examined by the local ethics committee, and informed consent was obtained from all patients.

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https://doi.org/10.1016/j.yebeh.2019.106587
1525-5050/

2.2. Instruments and procedures

Cross-cultural adaptation procedures were provided, and the Georgian version of the NDDI-E was developed. For this study, questionnaires were translated from English into Georgian by professional translators who were aware of the objectives of the study. The translated version was then evaluated for the semantic, cultural, conceptual, and idiomatic uniformity with the original English questionnaire. This final version was then translated back into English by other professional translators. The original and back-translated versions were compared for inconsistencies, and the final Georgian version of the NDDI-E questionnaires was agreed upon. This method of questionnaire translation is recommended in cross-cultural research [14].

Consecutive patients admitted at the INN with a diagnosis of epilepsy and who underwent antiepileptic drug (AED) treatment during the last six months were assessed with the Georgian versions of the NDDI-E and the Beck Depression Inventory (BDI) [15]; all patients were further assessed through systematic approach by qualified psychiatrist. Neuropsychiatric diagnostics were performed according to the International Statistical Classification of Diseases and Related Health Problems, 10th revision (ICD-10) criteria [16]. The best cutoff value was determined through receiver operating characteristics (ROC) analysis. The prevalence of psychiatric disorders was also studied.

2.3. Statistical analysis

Descriptive statistics were used for the demographic and clinical variables. Kolmogorov–Smirnov and Shapiro–Wilk tests were used to assess the normality of the distribution of continuous variables. Pearson's or Spearman's correlation coefficients were used to detect a linear correlation between contiguous numeric variables. Cronbach's alpha was calculated to evaluate the internal validity of the translated questionnaire. Sensitivity, specificity, and positive and negative predictive values were calculated for the Georgian version of the NDDI-E. The best cutoff value was determined through ROC analysis. A probability of less than 0.05 was considered statistically significant. Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) (IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp).

3. Results

In total, 130 individuals with epilepsy were included in the study. Table 1 shows various demographic and clinical characteristics of the study sample.

Table 1
Clinical and demographic characteristics of study participants (n = 130).

Variables	
Sex, n (%)	
Male	62 (47.7)
Female	68 (52.3)
Age; mean (standard deviation (SD)) [min.; max.]	32.3 (10.6) [18; 56]
Age at index seizure; mean (SD) [min.; max.]	18.5 (11.3) [1; 53]
Education, n (%)	
Elementary school	6 (5)
High school	80 (62)
University degree	44 (34.1)
Type of epilepsy, n (%)	
Focal	97 (74.6)
Generalized	28 (21.5)
Unknown	5 (3.8)
AED treatment, n (%)	
Monotherapy	95 (73.1)
Polytherapy	35 (26.2)
NDDI-E, mean (SD) [min.; max.]	13.5 (3.1) [7; 22]
BDI, mean (SD) [min.; max.]	16.8 (9.7) [1; 49]

Table 2
Distribution of psychiatric disorders among 130 individuals with epilepsy.

Diagnosis	n (%)
No psychiatric comorbidity	69 (53.1)
Depressive episode (F32)	21 (16.2)
Mixed anxiety and depressive disorder (F41.2)	10 (7.7)
Anxiety disorders	11 (8.5)
Generalized anxiety disorder (F41.1)	*8*
Other mixed anxiety disorder (F41.3)	*1*
Organic anxiety disorder (F06.4)	*1*
Adjustment disorders (F43.2)	*1*
Organic personality disorder (F07.0)	8 (6.2)
Dissociative convulsions (F44.5)	2 (1.5)
Mild cognitive disorder (F06.7)	8 (6.2)
Nonorganic sleep disorder, unspecified (F51.9)	1 (0.8)

The ICD-10 codes are included in parentheses. Italicized entries represents different types of anxiety disorders observed.

Among the 130 PWE, in 69 (53.1%), no psychiatric comorbidity was revealed. Depression was present in 21 (16.2%) individuals, and mixed anxiety and depression disorder was present in 10 (7.7%) cases. Our further analysis on the validation of the NDDI-E was based on those 31 patients, where depression or depression with comorbid anxiety was detected. In the remaining individuals, various mental disorders other than depression were detected (Table 2).

There were no statistically significant differences between individuals with depression and without depression in regard to the age at index seizure or the age at the start of AED treatment; there was also no association found between the clinical diagnosis of depression and polytherapy or type of epilepsy.

3.1. Analysis of internal consistency

The Georgian version of the NDDI-E had a Cronbach's alpha of 0.695, which means there was acceptable internal consistency of the questionnaire. Table 3 shows more details about Cronbach's alpha parameters for each item.

The screening questionnaire showed a significant positive correlation with the BDI scores (Spearman's rho = 0.687, $p < 0.001$), indicating a good concurrent validity.

3.2. ROC curve analysis against psychiatric diagnosis of depression

To assess the diagnostic value of the Georgian version of the NDDI-E questionnaire, we performed ROC curve analysis according to the clinical diagnosis of depression diagnosed by the professional psychiatrist. The ROC analysis showed an area under the curve of 0.975. The best balance of sensitivity (0.952) and specificity (0.880) was shown with a NDDI-E cutoff of 16 or greater. For more details, see Table 4.

4. Discussion

We studied the diagnostic value of the Georgian version of the NDDI-E questionnaire. Many similar studies have been conducted worldwide,

Table 3
Cronbach's alpha parameters of the NDDI-E.

Items	Corrected item-total correlation	Cronbach's alpha if item deleted
1. Everything is a struggle	0.354	0.676
2. Nothing I do is right	0.505	0.628
3. Feel guilty	0.294	0.696
4. I'd be better off dead	0.486	0.639
5. Frustrated	0.550	0.610
6. Difficulty finding pleasure	0.382	0.671

Table 4
ROC analysis and the basic characteristics of the Georgian version of the NDDI-E (positive for depression = 31, negative for depression = 99).

NDDI-E	Specificity	Sensitivity	PPV	NPV	AUC	SE	95% CI	p value
≥16	0.939	0.90	0.818	0.969	0.975	0.011	0.953–0.997	<0.001
≥17	0.80	0.60						

PPV — positive predictive value; NPV — negative predictive value; AUC — area under curve; SE — standard error; CI — confidence interval.

indicating the extreme importance of having a reliable screening tool for the identification of one of the most common psychiatric comorbidities for PWE. According to Kim and colleagues [17], who provided a meta-analysis of 13 different studies on the validation of the NDDI-E inventory, the cutoff score varies from 12 to 17 across different countries and cultural characteristics. At the same time, the authors declared that a cutoff score >13 might be an optimal solution. Our study results are in line with those findings. We established an optimal cutoff score for the Georgian version of the NDDI-E of 16 or greater. The results from other studies show a similar trend. For example, the German version of NDDI-E has a cutoff of 14 or greater [18], while the Spanish and Italian versions have lower cutoff and declare 13 points as an optimal cutoff for the diagnostic value [11,12]. Likewise, a study conducted in China also revealed the optimal cutoff to be more than thirteen [19]. It seems that different ethnocultural characteristics have great influence on the sensitivity and specificity parameters of the NDDI-E when it is translated and adapted for various languages.

Although psychiatric comorbidities, and depression in particular, are so problematic, there is a lack of knowledge among physicians, mainly due to inadequate training provided during university education [20]. This deficit interferes with the timely recognition and adequate management of mental illness in PWE. Therefore, finding a reliable and easy to use screening tool is vital.

It should be mentioned that in addition to MDD, other psychiatric disorders, such as generalized anxiety disorder (GAD), are common as well. According to our data, in 10 (7.7%) cases, MDD was associated with anxiety disorder, and in another 11 (8.5%) individuals, only anxiety was detected. It is obvious that for better diagnosis of mental disorders associated with epilepsy, screening tests should be developed for the detection of GAD. One study describes a successful attempt to combine the GAD questionnaire with the NDDI-E [21]. As a next step, the Georgian version of the GAD questionnaire might be developed to extend its use to the early detection of mental illness among PWE.

In conclusion, similar to other studies, the Georgian version of the NDDI-E showed acceptable sensitivity and specificity in the diagnosis of MDD in persons with epilepsy. We recommend using a cutoff value of 16 to achieve the best parameters and highest diagnostic value. We highly recommend incorporating the Georgian version of the NDDI-E into routine clinical practice. This approach will not only significantly increase the adequate management of MDD but will also promote the better control of epileptic seizures and improve the quality of life for PWE.

Our study has some limitations, however. Most importantly, patients in our study were recruited from the tertiary epilepsy care center and may reflect spectrum of the psychiatric comorbidities of more severely affected epilepsy cases. We have used the ICD-10 classification system to diagnose psychiatric disorders. Recently, the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) classification system is becoming more common, which, at some degree, applies diagnostic criteria different to the ICD-10 classification system. This difference may affect comparability of results of our study to other published articles. Psychiatric diagnoses in our study were provided through systematic approach by qualified psychiatrist; however, no structured diagnostic interview has been used (e.g., The Structured Clinical Interview for DSM-5 (SCID-5) or the Mini-International Neuropsychiatric Interview (M.I.N.I.)) as we have no validated Georgian versions of those diagnostic tools.

Funding

The study was supported by an internal scientific grant from Caucasus International University.

Acknowledgments

The authors are grateful to D. Kvernadze, K. Geladze, and M. Alkhidze, and the epileptologists of the Epilepsy Prevention and Control Centre at the Institute of Neurology and Neuropsychology (Tbilisi, Georgia) for their kind cooperation.

Declaration of Competing Interests

Sofia Kasradze received funding from the Caucasus International University. Other authors have no competing interests to declare.

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