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Validation of the Polish version of the Neurological Disorders Depression Inventory for Epilepsy (P-NDDI-E)

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SUMMARY

Introduction. Depressive symptoms are very frequent in the population of patients with epilepsy. Comorbidity between depression and epilepsy is estimated in the range of 9–62%. There are no epidemiological studies in Poland thus far in that area and there is no translated and validated screening tool for depression dedicated for persons with epilepsy (PWEs). In this study we intended to validate the Polish version of the Neurological Disorders Depression Inventory for Epilepsy (NDDI-E), which is a short and accurate scale used in many countries for assessment of depressive symptoms in PWEs.

Aim. The purpose of the study was to validate the Polish version of NDDI-E scale in the sample of PWEs.

Material and methods. The consecutive 257 patients with epilepsy (PWEs) who met inclusion and exclusion criteria, were recruited by neurologists-epileptologists during their routine outpatient visits in the period from November 2016 to February 2017. The respondents completed the Polish translated version of NDDI-E scale and were assessed with the MINI-International Neuropsychiatric Interview (MINI, depression module).

Results. After excluding assessments with missing data, we analyzed data of 253 subjects. Sixty-four patients (25.1%) had current major depressive disorder (MDD) according to the MINI criteria. The Cronbach's coefficient for the NDDI-E was 0.822. Receiver operating characteristic analyses showed an area under the curve of 0.882 ($p < 0.001$; asymptotic 95% confidence intervals ranged from 0.832 to 0.932). The cut-off point of 9 corresponded to sensitivity of 0.766 and specificity of 0.858.

Conclusion. The Polish version of NDDI-E scale after validation with a cut-off 9 points may be a useful tool for diagnosing depression in a Polish population of PWEs.

Key words: epilepsy • depression • Polish validation of the NDDI-E

Original paper

INTRODUCTION

Patients with epilepsy (PWEs) have worse quality of life than individuals from the general population not only because of occurrence of epileptic seizures, but also due to comorbid psychiatric disorders, especially depression (Jacoby et al., 2009; Kanner et al., 2012a; Yue et al., 2011). These symptoms are severe and more frequent in population of patients with epilepsy than in the general population (Jalava and Sillanpää, 1996; Kwon and Park, 2014; Tellez-Zenteno et al., 2007). Unfortunately, occurrence of depression is underestimated by clinicians treating patients with epilepsy. Appropriate identification of predictors of poor quality of life is essential for planning long-term therapeutic strategies for such patients (Kwan et al., 2009; Kerr, 2012; Taylor et al., 2011). The prevalence of depression in PWEs has been estimated at between 9% (Jacoby et al., 1996) and 62% (Lee et al., 2010). The literature remains inconclusive regarding risk factors of depressive disorders in epilepsy.

The NDDI-E is a self-report questionnaire designed to screen for a major depressive episode in patients with epilepsy (Gilliam et al., 2006). It consists of six statements about the last two weeks that are rated from 1 (never) to 4 (always/often). The statements were chosen in a way not to overlap with the common epilepsy deficits or the side effects of antiepileptic drugs. Each inventory item is rated by a PWE on a scale from 1 (never) to 4 (always or often). The minimum score is 6 and the maximum is 24 points. In the original version, the score above 15 points has a high predictive value for major depression (Gilliam et al., 2006). The NDDI-E has been translated from English into other languages and approved as a tool for the diagnosis of depression in PWEs in Argentina (Thomson et al., 2014), Brazil (De Oliveira et al., 2010), Italy (Mula et al., 2012), China (Guo et al., 2015), France (Micoulaud-Franchi et al., 2015), Spain (Di Capua et al., 2012), Korea (Ko et al., 2012), Japan (Tadokoro et al., 2012), Germany (Metternich et al., 2012) and Greece (Zis et al., 2013). The aim of this study was to validate the Polish version of the NDDI-E scale.

MATERIAL AND METHODS

The consecutive 257 persons with epilepsy (PWEs), who fulfilled inclusion and exclusion criteria, were recruited by physicians with specialization of neurology and epileptology in the period from Nov. 10, 2016 to Feb. 28, 2017 during their routine outpatient visits. The following epilepsy treatment centers were involved in the study: 1. Epilepsy Diagnostic and Therapeutic Center, Foundation of Epileptology, Warsaw; 2. Country Hospital, Department of Neurology, Epileptic Clinic, Lublin; 3. Department of Neurology and Epileptology, Medical Center for Postgraduate Education, Warsaw. All physicians were certified neurologists with certification of Polish Society of Epileptology as qualified epileptologists.

The inclusion criteria were: 1. Consecutive adult patients (18 years or older), male and female with established diagnosis of epilepsy according to the ILAE Classification of Seizures and Epileptic Syndromes (Commission on Classification and Terminology, 1981, 1985). 2. The patients have been in the care of the neurologists/epileptologists. 3. All patients were receiving antiepileptic (AED) medications, which have not been changed during last year. 4. The patients who had the ability to provide informed consent and who agreed to participate in the study.

The exclusion criteria were: 1. Possible coexisting non-epileptic events, in particular, psychogenic pseudoepileptic seizure. 2. Coexisting serious renal, liver or blood disorders. 3. Progressive brain disorders, e.g., tumor, degenerative or inflammatory processes. 4. Other than depression psychiatric disorders.

After signing the informed consent, the respondents received a questionnaire containing the NDDI-E, Polish version, and the questions included in the Major Depression Module of the MINI-International Neuropsychiatric Interview (MINI). The attending neurologist interviewed the study participant and completed the questionnaire containing demographic and medical data.

The translation was conducted in accordance with the procedure recommended by the authors of the original NDDI-E instrument. The English version was translated into Polish language by a team of psychiatrists who fluently speak English and then back-translated into English by two independent native speakers. This version was submitted to the commission of authors of the original version in order to assess whether the original meaning of statements was preserved. After discussion about the divergences between the original English version and back-translated Polish version and introduction of recommended modifications, Polish version was printed and used for this study. As a reference for NDDI-E we used a validated Polish version

of MINI (Masiak and Przychodzka-Masiak, 2002) MINI is a short structured clinical interview, which enables researchers to make diagnoses of psychiatric disorders. We used only the Major Depression Module that is a qualitative test to obtain diagnosis of depression, which was used to divide the whole study sample for two subgroups – major depressive episode and non-major depressive episode.

Statistical analysis

Reliability analysis was performed using Cronbach's α along with inter-item and corrected item-total correlations (correlation between particular item and total score of all other items) for both groups.

The Confirmatory Factor Analysis (CFA) was performed to check whether factor structure of Polish validation of NDDI-E resembles one factor structure of the original questionnaire. The data were not normally distributed and therefore the Robust Maximum Likelihood method was chosen for the CFA (Li, 2016; Rhemtulla et al., 2012). Model fit for each model was evaluated based on χ^2, Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Standardized Root Means Square Residual (SRMR) and Root Means Square Error of Approximation (RMSEA). Satorra-Bentler correction for χ^2 was used regardless non-normality of the data.

The Receiver-Operating Characteristic (ROC) was performed to obtain specificity, sensitivity and cut-off point. The ROC analysis was obtained by comparing the NDDI-E scores between those with and without depression based on the MINI items. Between group differences in NDDI-E score were also examined and were used as indication of validity of NDDI-E. Considering the non-normal distribution of the NNDI-E score in each group the Mann-Whitney U test was performed. Effect size was estimated as r value, which can be interpreted as variance explained or variance shared between two variables. To check possible influence of age and sex on between group differences in NDDI-E score additional analysis was performed. Differences in age groups between DP and NDP were examined with Mann-Whitney U test and differences in proportion of men and women between DP and NDP were examined with χ^2 test.

The statistical analysis was performed using the SPSS and R software.

Local Ethical Committee

The protocol of the study was submitted and approved by the Bioethics Committee of the Medical University of Warsaw.

RESULTS

Participants

Two hundred fifty-seven patients participated in this study. Four patients were excluded from further analyses due to missing data. The remaining study population consisted of 253 patients of which 104 were men and 149 were women (demographic data are presented in Table 1). Mean NDDI-E score was 6.93 (SD = 3.71). The total sample was then split into two subgroups based on diagnosis of depression using the MINI Major Depression Module. This resulted in two groups: depressed patients (DP) consisting of 64 individuals, with median NDDI-E score of 10 (IQR = 4.25) and non-depressed patients (NDP), including 189 individuals, with median NDDI-E score of 6 (Interquartile range (IQR) = 4).

Table 1. Demographic information about participants in the study

Number of participants	**253**
% Female	58.9
% Male	41.1
% Diagnosed with depression	25.3
NDDI-E Age groups (%):	
<21 years	8.7
21–35 years	51.8
36–50 years	24.1
51–65 years	11.1
>65 years	4.3
Years of treatment (SD)	**16.8 (12)**
Number of seizures (SD)	**1.8 (1.6)**

Reliability analysis

The reliability analysis resulted in Cronbach's α = 0.822, indicating good internal consistency. The corrected item-total correlations ranged from 0.495 to 0.684, showing that most of the items had corrected item-total correlations values above 0.5. The corrected item-total correlations and inter-item correlations are presented in Table 2.

Confirmatory Factor Analysis

Minimum ratio of sample size to number of items was fulfilled, which allowed to estimate adequate Confirmatory Factor Analysis (CFA) loadings (Everitt, 1975). Fit

Table 2. Inter-item, corrected item-total correlations and factor loadings of NDDI-E (N = 253)

NDDI-E ITEM	1	2	3	4	5	6	Corrected Item-total correlations	CFA Factor loadings
1	1.000						0.495	0.544
2	0.469	1.000					0.595	0.650
3	0.411	0.518	1.000				0.684	0.777
4	0.252	0.381	0.491	1.000			0.530	0.603
5	0.354	0.382	0.518	0.464	1.000		0.609	0.685
6	0.387	0.456	0.558	0.412	0.539	1.000	0.643	0.724

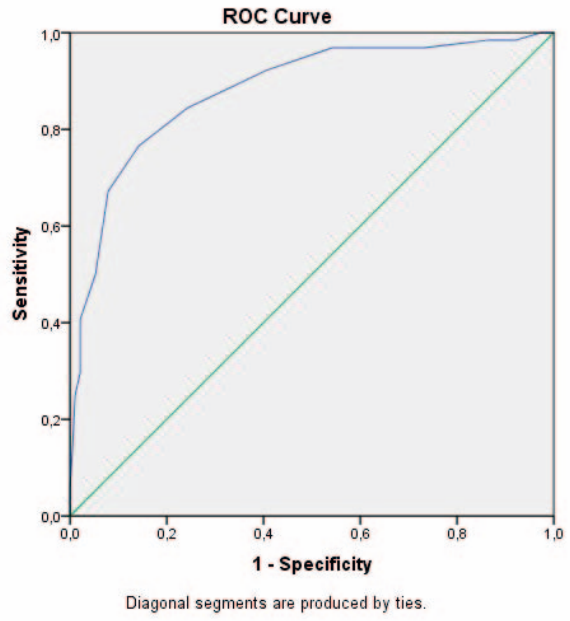

Figure 1. Receiver Operating Characteristics (ROC) of NDDI-E score predicting depression diagnosis based on The Mini–Mental State Examination (MMSE). The Y axis represents Sensitivity (True positive rate), the X axis represents 1 – Specificity (False positive rate). The green line represents area under the curve (UAC) of 0.5, which account for random test accuracy. The blue curve represents AUC of NDDI-E score predicting depression diagnosis.

indices of the NDDI-E model indicated acceptable model fit. The χ^2 test for the NDDI-E reached significance ($p = 0.027$) indicating discrepancy from the real covariance structure of the general population data. However, other fit indices showed good values: CFI = 0.977, TLI = 0.962, RMSEA = 0.069 and SRMR = 0.038. Factor loadings of 2-factor model were all significant and were ranging from 0.544 to 0.777 (see Table 2).

Validity analysis – Receiver Operating Characteristics

The ROC analysis resulted in AUC of 0.882 ($p < 0.001$; asymptotic 95% confidence intervals ranged from 0.832 to 0.932). The cutoff of 9 points corresponded to sensitivity of 0.766 and specificity of 0.858 (Figure 1).

Between Group differences

Gender differences

There were no differences in number of men and women between DP and NDP ($\chi^2 = 0.681$, $p = 0.409$).

Age differences

There were no differences in age between DP and NDP; Mann-Whitney test was nonsignificant ($U = 6400$, $p = 0.449$; $r = 0.048$).

NNDI-E differences

There were significant differences in NDDI-E scores between DP and NDP: Mann-Whitney test was significant ($U = 1429$, $p < 0.001$) resulting in $r = 0.576$, which corresponds to the large effect size.

DISCUSSION

The comorbidity of depression and epilepsy is a quite common phenomenon; the prevalence of depression in epilepsy ranges between 9% and 62%% (Jacoby et al., 1996; Lee et al., 2010). Depression has been found to commonly occur in temporal lobe epilepsy and has been shown to influence quality of life and cognitive functioning in these individuals (Jones et al., 2005; Kwan et al., 2009; Kerr, 2012; Perrine et al., 1995; Taylor et al., 2011). Generally the relationships between the two disorders are not well explained and this important topic is constantly being explored. In addition, scarce data is available on treatment of depression in people with epilepsy (Kanner et al., 2012b; Kwon and Park, 2014)

There are only few studies analyzing incidence or predisposing factors of depression in patients with epilepsy in Poland (Wiglusz et al., 2017). Scarcity of such knowledge may affect strategies of long-term therapy

and, as a result, quality of life of patients with epilepsy (Zhao et al., 2011). We assumed that this may be largely caused by a lack of standardized tools suitable for evaluating depressive symptoms in individuals with epilepsy. In many countries NDDI-E scale is used for such purposes – this instrument is a short, simple and accurate scale that was constructed so that symptoms of depression would not overlap with symptoms of epilepsy or side effects of antiepileptic drugs (Thomson et al., 2014; De Oliveira et al., 2010; Mula et al., 2012; Guo et al., 2015; Micoulaud-Franchi et al., 2015; Di Capua et al., 2012; Ko et al., 2012; Tadokoro et al., 2012; Metternich et al., 2012; Zis et al., 2013).

Presented study aimed at evaluating validity of the NDDI-E scale in a Polish sample of persons with epilepsy recruited by neurologist-epileptologists from the certified epilepsy centers. We analyzed 255 questionnaires including NDDI-E and MINI-Depression Module filled in by PWE. From this group, 25% of patients had major depressive disorder (MDD) according to the ICD-10 criteria. The Polish version of the NDDI-E scale showed excellent reliability and the selected cut-off of 9 points corresponded to satisfying sensitivity and specificity of its diagnostic properties. The above analysis allowed us to prove validity of the instrument. The NDDI-E scale may be then successfully used in the Polish population of people with epilepsy.

The NDDI-E scale may be useful in every day clinical practice and for further research to explore factors having impact on symptoms of depression in epilepsy. For example, it would be important to study influence of particular types of epilepsy on appearance and course of depression. It is fully justified to introduce the validated NDDI-E scale to the research methodology and clinical practice of physicians treating patients with epilepsy in Poland.

CONCLUSIONS

In this study we provided the evidence supporting the validity of the NDDI-E scale with a cut-off of 9 points for Polish population of patients with epilepsy. We confirmed that NDDI-E is a suitable tool and we encourage to use it in further studies and clinical practice.

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CONFLICT OF INTEREST DISCLOSURE

The authors declare no conflict of interest.

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