

RECOGNIZING DEPRESSION IN PATIENTS WITH PARKINSON'S DISEASE

Accuracy and specificity of two depression rating scale

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ABSTRACT - This study aimed to find cut-off scores for the Montgomery-Asberg rating scale (MADRS) and the Beck depression inventory (BDI) that can relate to specific clinical diagnoses of depression in Parkinson's disease (PD). Mild and moderate PD patients (n=46) were evaluated for depression according to the DSM IV criteria. All patients were assessed with the MADRS and the BDI. A "receiver operating characteristics" (ROC) curve was obtained and the sensibility, specificity, positive and the negative predictive values were calculated for different cut-off scores of the MADRS and the BDI. The Kappa statistic was calculated for different cut-off scores to assess the agreement between the clinical judgment and both scales. Depression was present in 18 patients. MADRS cut-off scores of 6 and 10 showed Kappa 0.5 and 0.56, respectively. Specificity of cut-off score of 6 was 78.6% and of cut-off score of 10 was 96.4%. Kappa agreement of BDI cut-off scores of 10 and 18 were 0.36 and 0.62, respectively. Specificity was 60.7% for 10 and 92.9% for 18. Both rating scales show similar accuracy within the ROC curves (84.3% for MADRS and 79.7% for BDI). The MADRS and the BDI show a good accuracy and correlation to the clinical diagnosis when a cut-off score of 10 is used to MADRS and a cut-off score of 18 is used to BDI to recognize depression in mild to moderate PD patients. This may help clinicians to recognize depression in PD.

KEY WORDS: depression, Parkinson's disease, Montgomery-Asberg rating scale, Beck depression inventory.

Reconhecimento de depressão em pacientes com doença de Parkinson: acurácia e especificidade de duas escalas de avaliação de depressão

RESUMO - Este estudo objetivou encontrar pontos de corte da escala de depressão de Montgomery-Asberg (MADRS) e inventário de depressão de Beck (IDB) que possam estar relacionados ao diagnóstico clínico específico de depressão na doença de Parkinson (DP). Os pacientes com DP leve e moderada (n= 46) foram avaliados para depressão de acordo com os critérios diagnósticos da DSM-IV. MADRS e IDB foram aplicadas em todos os pacientes. Uma curva "receiver operating characteristics" (ROC) foi obtida calculando-se sensibilidade, especificidade, valores preditivos positivo e negativo para diferentes pontos de corte da MADRS e IDB. O índice Kappa foi calculado verificando-se a concordância entre o julgamento clínico e, ambas as escalas em diferentes pontos de corte. A depressão estava presente em 18 pacientes. Os pontos de corte 6 e 10 da MADRS evidenciaram índice Kappa de 0,5 e 0,56 respectivamente. A especificidade para o ponto de corte 6 foi 78,6% e para o ponto de corte 10 foi 96,4%. O índice Kappa para os pontos de corte 10 e 18 do IDB foi 0,36 e 0,62 respectivamente. A especificidade foi 60,7% para o ponto de corte 10 e 92,9% para o 18. Ambas as escalas mostraram acurácia semelhante pelas curvas ROC (84,3% para MADRS e 79,7% para IDB). A MADRS e o IDB mostraram uma boa acurácia e correlação com o diagnóstico clínico quando o ponto de corte 10 foi utilizado para MADRS e o 18 para o IDB. A sugestão de tais pontos de corte tem por objetivo auxiliar aos clínicos no reconhecimento de depressão na DP leve e moderada.

PALAVRAS-CHAVE: depressão, doença de Parkinson, escala para avaliação de depressão de Montgomery-Asberg, inventário de depressão de Beck.

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Depression is a syndrome that may cause significant impairment in patients with Parkinson's disease (PD). It can also worsen the course of social and family burden and to increase direct and indirect costs of the disease¹⁻³. Despite its importance in PD, a study showed that neurologists failed to identify the presence of depression more than half of the time during routine office visits⁴. On the other hand, psychiatrists may be faced with the same problem. Symptoms such as insomnia, loss of libido, loss of appetite and energy in depression may be attributed to PD whereas hypomimia, hypophonia, stooped posture and bradykinesia in PD may mimic depression⁵. Thus, depression in PD may either be neglected or sometimes mistakenly diagnosed as present.

The Montgomery-Asberg rating scale (MADRS)⁶ is used as a diagnostic instrument for depression in some studies^{7,8} whereas other authors use the Beck depression inventory (BDI)⁹⁻¹². The study of different cut-off scores in both scales may help clinicians to diagnose and recognize depression in PD.

The aim of the present study is to ascertain cut-off scores for the MADRS and the BDI that can relate to specific clinical diagnosis of depression in PD patients.

METHOD

Patients – A consecutive series of PD outpatients (n=100) who attended three different neurology clinics were screened for participation in the study. The exclusion criteria were dementia or a comorbid neurological disease, and any neurosurgical procedure. Illiterate patients or patients with a psychiatric diagnosis other than depression, or using antidepressant drugs at the time of the evaluation, or at least three months prior to the first interview were also excluded from the study. A total of 46 patients fulfilled the inclusion criteria, 18 of which met the Diagnostic and Statistical Manual of Mental Disorders, 4th edition (DSM-IV) criteria¹³ for depression.

In order to exclude dementia and cognitive deficits all patients performed two screening tests, namely the Mini-mental State Exam (MMSE)¹⁴ and the Cambridge Examination for Mental Disorders of the Elderly (CAMDEX/CAMCOG)¹⁵ (required score above 80). We employed a validated Brazilian version of the CAMCOG¹⁶.

The local Research Ethics Committee approved this study. All subjects signed the written consent.

Neurological examination – A neurologist evaluated all patients for a detailed diagnosis of PD. All of them met the diagnostic criteria for PD as defined by the United Kingdom Parkinson's Disease Society Brain Bank (UK-PDS-BB)¹⁷. The Unified Parkinson's Disease Rating Scale (UPDRS)¹⁸ and the Hoehn and Yahr stages¹⁹ were used to stage the course of PD and to assess symptom intensity. The rating scales were performed in the morning to avoid the "off" phenome-

non. Only the Hoehn and Yahr stages will be presented in this study. All patients presented normal brain computerized tomography.

Psychiatric examination – A psychiatrist (CDS) evaluated the patients using the DSM IV criteria to diagnose depression. All the patients were assessed with the BDI and the MADRS by another psychiatrist (JL) who was blind to the clinical diagnosis.

Instruments – The MADRS is able to rate the symptom intensity and is sensitive to early changes of depressive symptoms. Thus, this scale is useful to evaluate the treatment outcome with drugs. Although the MADRS was designed to avoid emphasis on the somatic symptoms of depression, PD patients may have higher scores in this scale because of the physical symptoms of the disease². We employed a validated version of this scale in Portuguese²⁰.

The BDI is a self rating scale. The severity of depression is usually determined according to the BDI scores as follows: mild (10-17), moderate (18-24) and severe (25-30). Recognizing moderate and severe depression may be easier than recognizing milder states with this scale. On the other hand, physical symptoms of PD may account for moderate and severe BDI scores. There is a validated version in Portuguese²¹.

Statistical analysis – The areas under the respective receiver operating characteristic (ROC) curves with 95% confidence intervals (95% CI) were used to compare the BDI and the MADRS scores.

Physician judgment according to DSM-IV criteria was considered the gold standard test. Different BDI and MADRS cut-off scores were also evaluated regarding sensibility, specificity, positive and negative predictive values. The reliability of both scales in different cutoff scores was estimated by the Kappa statistic. Ninety-five percent confidence interval (95% CI) was estimated using a procedure based on χ^2 goodness-of-fit test²². In order to determine the ability of the MADRS and the BDI to discriminate parkinsonian patients with depression, ROCs were analyzed comparing these scales.

RESULTS

The patient's median age was 68.1 (range 53-88) (n=46), 58.7% were male and the prevalence of depression was 39.1% (n=18).

The severity of PD by Hoehn and Yahr¹⁹ stages and the presence of depression are shown in Table 1.

The MADRS and BDI areas under the ROC curve revealed similar results, 84.3% (95% CI=72%-96.7%) and 79.7% (95% CI=63.7%-95.6%), respectively (Table 2).

The majority of parkinsonian patients without depression are located in Hoehn and Yahr stages 1 and 2.5 (39.20%) (Table 3).

A MADRS cut-off score of 6 shows a sensibility of

Table 1. Severity by Hoehn and Yahr stages in patients with or without depression.

	Depression		Total
	No	Yes	
1	9 19.6%	1 2.2%	10 21.7%
2	6 13.0%	3 6.5%	9 19.6%
2,5	9 19.6%	6 13%	15 32.6%
3	4 8.7%	5 10.9%	9 19.6%
4		3 6.5%	3 6.5%
Total	28 60.9%	18 39.1%	46 100%

72.2% and a specificity of 78.6%. Using this cut-off, the positive and negative predictive values are 68.4% and 81.51%, respectively. Kappa agreement between the physician judgment according to DSM-IV criteria and the MADRS was 0.50 (95% IC=0.50 to 0.76).

The sensibility and specificity of a cut-off score of 10 is 55.6% and 96.4%, respectively. Using this cut-off, the positive predictive and negative predictive

Table 2. Area under the curve in the Montgomery Asberg depression rating scale (MADRS) and Beck depression inventory (BDI).

Test result variable(s)	Area	Asymptotic 95% Confidence interval	
		Lower Bound	Upper Bound
MADRS	.843	.720	.967
BDI	.797	.637	.956

^aUnder the nonparametric assumption; Null hypothesis: true area = 0.5.

values are 90.9% and 77.1%, respectively. Kappa agreement between the physician judgment according to DSM-IV criteria and the MADRS was 0.56 (95% IC=0.31-0.81).

The validity and reliability measures of the BDI are presented in Table 4.

A BDI cut-off score of 10 yields a sensibility of 77.8% and a specificity of 60.7%. Positive and negative predictive values with this cut-off are 56% and 80.9%, respectively. The Kappa agreement between the DSM-IV criteria and the BDI was 0.36 (95% IC=0.0-0.62). The sensibility of a cut-off score of 18 is 66.7% and the specificity is 92.9%. Using this cut-off, the positive and the negative predictive values are 85.7% and 81.2%, respectively. Kappa agreement between DSM-IV criteria and BDI is 0.62 (95% IC=0.38-0.86).

Table 3. Validity measures and reliability by Kappa statistic for the Montgomery Asberg depression rating scale.

Cut-off	Sensibility	Specificity	PPV	NPV	Kappa (IC 95%)
6	72.2	78.6	68.4	81.5	0.50 (0.50-0.76)
8	72.2	82.1	72.2	82.1	0.54 (0.29-0.80)
10	55.6	96.4	90.9	77.1	0.56 (0.31-0.81)
18	22.2	100	100	33.3	0.26 (0.04-0.48)
20	16.7	100	100	65.1	0.20 (-0.01-0.40)

PPV, positive predictive value; NPV, negative predictive value.

Table 4. Validity measures and reliability by Kappa statistic for the Beck depression inventory.

Cut-off	Sensibility	Specificity	PPV	NPV	Kappa (IC 95%)
10	77.8	60.7	56.0	80.9	0.36 (0.10-0.62)
18	66.7	92.9	85.7	81.2	0.62 (0.38-0.86)
25	27.8	100	100	68.3	0.32 (0.09-0.55)

PPV, positive predictive value; NPV, negative predictive value.

DISCUSSION

This study presents validity measures (specificity, sensibility and accuracy) by ROC curve for determining depression in PD patients with two depression rating scales, the BDI and the MADRS. A MADRS cut-off score of 6 is frequently used to detect the presence of depression in PD^{7,8}. However, our results show that the cut-off score of 10 presents a higher specificity than the usual cut-off (78.6% and 96.4%, respectively), despite the low sensibility which is comparable to those found in other studies.

The agreement (Kappa) between the DSM IV criteria for depression and the MADRS score of 10 shows little increment when compared to a cut-off score of 6. Using both specificity and Kappa results, we find that a score of 10 is a better cut-off to recognize depression in PD patients in the clinical practice. Leentjens²³ also studied the concurrent validity of the MADRS and the Hamilton Rating Scale for Depression (HAM-D-17)²⁴ and found 17/18 on the MADRS as a cut-off score of high specificity and positive predictive value (PPV) to discriminate depression in PD patients. A lower cut-off of 14/15 was considered as a good screening score. Our data show that with a lower cut-off (10) there is little difference in diagnostic specificity (96.4% for a cut-off score of 10 and 100% for a cut-off score of 18). On the other hand, the agreement between diagnostic criteria and the MADRS is better with a cut-off score of 10 than with a cut-off score of 18 (Kappa=0.56 and 0.26, respectively).

Regarding the BDI, a cut-off score of 10 is usually used to detect the presence of depression in patients with PD⁹⁻¹¹. However, in our sample the best cut-off score to recognize depression in PD is 18. This cut-off provides high specificity (92.9%), whereas the cut-off score of 10 shows a specificity of only 60.7%. The agreement between the diagnostic criteria and the BDI is better with a cut-off score of 18 than with a cut-off score of 10 (Kappa=0.62 and 0.36, respectively). Leentjens et al.²⁴ found a high specificity with a cut-off score of 16/17 on the BDI. This would be in agreement with our data.

In our study, the MADRS and the BDI areas under the ROC curve revealed similar results, 84.3% (95% CI=72%-96.7%) and 79.7% (95% CI=63.7%-95.6%) respectively. This finding suggests that both scales may be used to help diagnosing and staging the severity of depressive symptoms in PD. However, the MADRS depends on the clinician's direct observation whereas the BDI is an inventory rated by the patient. The use of both scales could be regarded as comple-

mentary, provided that these cut-off scores are taken into account.

Some limitations of our study should be reported. Our sample was mainly composed of mild and moderate PD patients. Few patients were rated as 3 and 4 in Hoehn and Yahr stages. The majority of patients evaluated in these stages were unable to be included in this study because of dementia, illiteracy or use of antidepressant drugs. Therefore, the results of the study may apply only to mild and moderate PD patients. Only one psychiatrist diagnosed depression in our study. Further categorization of depression in major and minor depression was not attempted. This study did not have a control group of depressed patients in order to compare with the results of both depressed and nondepressed PD patients.

In conclusion, depression is a clinical diagnosis that may be best yielded by the structured DSM IV criteria. However, the use of rating scales such as the MADRS and the BDI show a good accuracy and correlation to the clinical diagnosis of depression when cut-off scores of 10 to the MADRS and of 18 to the BDI are applied. These cut-off scores may help clinicians make a specific diagnostic of depression in mild and moderate PD patients in clinical practice.

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