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Comparing the Single-item Visual Analog Scale with Multi-item Hospital Anxiety and Depression Scale, and Patient Health Questionnaire-9 to Diagnose Depression in Patients with Idiopathic Parkinson's Disease

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Abstract

Background: Depression is one of the common non-motor symptoms in patients with Parkinson disease (PD), which can have a negative effect on the quality of life of the patients. Therefore, it is necessary to have suitable, accurate, cheap, and simple diagnostic tools to identify depression in patients with PD and apply a proper treatment. The current study aimed at comparing the single-item visual analog scale (VAS) with the multi-item hospital anxiety and depression scale (HADS) and patient health questionnaire-9 (PHQ-9) in respect to their sensitivity and specificity to diagnose depression in patients with idiopathic PD.

Methods: The current cross sectional, comparative study employed the simple non-probability method and selected 79 patients with idiopathic PD, with the mean (SD) age of 59.10 (10.84) years and the average (SD) of disease progression level of 3.24 (1.13), based on Hoehn and Yahr scale. The single-item scale VAS and multi-item tests HADS and PHQ-9 were used as an index tests, and Beck depression inventory (BDI) was employed as the reference test to evaluate depression in 3 levels of lack of (or mild) depression, moderate depression, and severe depression using 90% sensitivity and 90% specificity. To determine the sensitivity, specificity, and the ability of each index test in order to diagnose depression, agreement percent of index tests with reference test and receiver operating characteristic (ROC) analysis were used.

Results: The results of ROC analysis showed that VAS (AUC = 0.84) and HADS (AUC = 0.87) and PHQ-9 (AUC = 0.85) possessed similar abilities to discriminate depression in patients with PD. The sensitivity of VAS, HADS, and PHQ-9 tests in moderate or greater threshold were 92%, 96%, and 89%, respectively, and in severe threshold were 64%, 79%, and 49%, respectively. Specificity of these tests in moderate or greater threshold were 42%, 50%, and 62%, respectively, and in severe threshold were 88%, 77%, and 88%, respectively. The highest agreement level with BDI in mild/moderate and severe levels of depression were found in VAS and PHQ-9, respectively.

Conclusions: The single-item scale VAS, similar to multi-item tests HADS and PHQ-9, had a low to high sensitivity and specificity to diagnose depression in moderate or greater and severe thresholds in patients with PD.

Keywords: Idiopathic Parkinson Disease, Depression, Sensitivity, Specificity

1. Background

Parkinson disease (PD) is a neurodegenerative disease with a prevalence about 1% to 2% in people over 65 years old (1, 2). The prevalence of this disease is estimated about 222.9 in every 100,000 individuals in Tehran (3). Depression is one of the common non-motor symptoms (about 30% to 40%) with an unknown cause, which has a negative effect on quality of life, functional, and cognitive ability of the patients (4), and can impose a great cost on the health system. Moreover, depression has a high correlation with suicide and is considered as a third reason for disability worldwide (5, 6). Therefore, diagnosis of depression in patients with PD could be helpful in their treating and preventing the damages caused by depression.

A suitable and useful tool is necessary to diagnose and determine the severity of depression in patients with PD. The suitability and usefulness of a depression diagnostic tool is measured according to the number of false-positive, which is the number of people without depression who are diagnosed incorrectly as the ones with depression in screening (7). Undue costs are the results of high false-

positive (8). On the other hand, the ratio of false-negative (ie, the number of people with depression who are not diagnosed correctly) should be considered and this can lead therapists not to attend to the depression signs and symptoms and treatment (9).

Due to the complex concepts of depression, there are several methods for its diagnosis. One of these methods is using a standard questionnaires with several questions such as Beck depression inventory (BDI), hospital anxiety and depression scale (HADS), and patient health questionnaire-9 (PHQ-9). Reduced error and bias are some of the advantages of such questionnaires. But, these questionnaires are costly and time consuming and are not suitable for initial evaluation and screening. Another group of the tools are single-item scales such as visual analog scale (VAS) to measure depression. The advantages of such scales are their shortness and less completion time. A reliable and valid single-item scale is a proper tool for initial screening and evaluation, particularly in daily care centers or studying a large sample of people in a time-limited period (10, 11). So far, however, only 2 studies are conducted on comparing single- or 2-item scale and standard questionnaires of depression. In 1 study, psychometric properties of a simple item with "yes" or "no" answers (have you felt depressed or sad most of the past year?) were evaluated an analyzed, compared with PHQ-9 in veteran affairs primary care setting (7), and in another study, comparison of depression single-item scale with PHQ-9 was studied to identify normal people with depression in Australia (9). But, none of these studies was conducted on patients with PD. On the other hand, the method of diagnosing depression and using depression diagnosis tools totally depends on the culture and the kind of disease (12). Therefore, the current study aimed at comparing the single-item VAS with HADS and PHQ-9 to identify patients with PD. Further, the current study investigated the sensitivity, specificity, and positive and negative predictive values of single-item VAS, multi-item HADS, and PHQ-9 with those of BDI questionnaire, as a reference scale.

2. Methods

2.1. Participants

The current non-experimental, cross sectional, comparative study employed simple non-probability method and selected 79 patients with PD (69 male, 10 female) by mean (SD) disease progression level of 3.24 (1.13), based on Hoehn and Yahr scale in patients with idiopathic PD referred to health centers of Tehran, Iran. Inclusion criteria for the current study were idiopathic PD based on a neurologist diagnosis, no cognitive damage based on the mini-mental status examination (MMSE) (scores > 21) (13), no orthopedic and neurological disorders except PD according to the medical record or patient's report, no common surgery for PD according to the medical record or patient's report, and the ability to read and write in Persian. The study was started with the approval of ethics committee of Iran University of Medical Sciences and receiving the written consent from patients to participate in the study.

2.2. Procedure

Demographic data including age, time since diagnosis of PD, and education level were collected through a demographic questionnaire (Table 1). The single-item VAS and multi-item HADS and PHQ-9, as index tests, and BDI, as a reference test, were used to diagnose depression. All tests were performed in an off-drug phase. The sequence of tests was completely random. The cutoff point values for all tests (VAS, HADS, and PHQ-9) to identify different levels of depression were calculated using the sensitivity and specificity of at least 90% (14) and the results are reported in Table 2. The scores higher than 90% sensitivity were considered as the first level. The scores between 2 points of 90% sensitivity and 90% specificity were considered as the second level, and the scores less than 90% specificity were considered as the third level. The cutoff values for the 2 thresholds of questionnaire were determined for varying levels of sensitivity and specificity (at least 0.90 and at least 0.90, respectively). Also, the points between lack of depression and moderate and severe depression were considered as one threshold, and the point between severe depression and lack of depression or a moderate depression was considered as another threshold (9-19).

2.3. Outcome Measures

2.3.1. Single-item VAS

Single-item VAS is based on a 100-mm line, which its left end (0) shows lack of depression and its right end shows (100) severe depression. Patients were asked to rate their depression during the past 2 weeks between lack of depression and severe depression on the line (14). It is a suitable tool to classify the level of depression and also screen patients with depression (9).

2.3.2. HADS

The multi-item HADS includes 14 questions, among which 7 questions are related to the depression subscale and 7 to the anxiety subscale. Each item is scored based on a Likert scale ranging from 0 to 3 in which 3 shows the most severe state. The total score for each subscale ranges between 0 and 21, which the highest score indicates the most severe depression (16). The depression subscale of the test was used in the current study. In a study by Schrag et al., in

Britain, good internal consistency and test-retest reliability of HADS was reported in patients with PD (4). Montazeri et al., also reported an acceptable validity and reliability of Iranian version of this scale in patients with breast cancer (Cronbach's alpha = 0.86 and 0.78 for depression and anxiety subscales, respectively) (17).

2.3.3. PHQ-9

The multi-item PHQ-9, a 9-item questionnaire, is used to diagnose depression and its severity in clinical environments. Each item is scored between 0 and 3, based on a Likert scale in which 3 is the most severe form. Total score for this scale ranges between 0 and 21, which the highest score indicates the most severe depression (18). This test has a suitable validity and reliability (ICC = 0.86-0.89, r = 0.7), and also good sensitivity (19).

2.3.4. BDI

BDI was used as a reference test, which its cutoff point to evaluate depression threshold is determined for patients with PD (4). This scale was also used as a reference test in previous studies (20, 21). BDI is a self-report scale consisted of 21 items. Each item is scored from 0 to 3, based on a Likert scale in which 3 is the most severe form. Total score of this scale ranges from 0 to 63, among which 0 to16, 17 to 29, and 30 to 63 indicate the mild, moderate, and severe depression, respectively (22). BDI is used to screen depression, measure the severity of symptoms, and evaluate the response to the medications and surgery in patients with PD (4-22). This test has a high internal consistency and test-retest reliability (ICC = 0.93, a = 0.91) (23). In the current research, scores of 14 or greater in BDI were considered as a cutoff point to classify patients as with/without depression (4).

2.3.5. Statistical Analysis

Frequency and frequency percent were used to analyze the agreement between VAS, HADS, PHQ-9, and BDI to evaluate depression severity. Then, the answers of BDI were classified into 2 groups of with and without depression, according to the cutoff point 14 or greater. Considering BDI as a reference test, the sensitivity, specificity, and positive and negative values of VAS, HADS, and PHQ-9 were calculated to investigate depression severity in 2 different cutoff points (moderate or greater and severe thresholds). The area under the curve of receiver operating characteristic (ROC) was used to compare the ability of VAS, HADS, PHQ-9 with that of BDI to identify patients with PD and depression.

3. Results

Demographic data of participants and descriptive data of VAS, HADS, PHQ-9, and BDI are shown in Table 1.

Table 1. Descriptive Demographic Data and Outcome Measures in Subjects with Idiopathic Parkinson Disease (N = 79)

Demographic Data	Values
Gender[a]	
Male	69 (87.34)
Female	10 (12.66)
Disease progression level, based on Hoehn and Yahr scale[a]	
First stage	6 (7.6)
Second stage	12 (15.2)
Third stage	31 (39.2)
Forth stage	17 (21.5)
Fifth stage	13 (16.5)
Educational level[a]	
Diploma or lower	59 (74.7)
Associate degree or bachelor	13 (16.5)
Master or PhD	8 (8.8)
Age, y[b]	59.10 (10.84)
Time since the disease diagnosis, y[b]	9.30 (6.03)
Outcome Measures	
VAS[b]	59.72 (17.38)
HADS[b]	10.89 (3.90)
PHQ-9[b]	12.46 (5.13)
BDI[b]	20.51 (11.11)

Abbreviations: BDI, Beck Depression Inventory; HADS, Hospital Anxiety and Depression Scale; PHQ-9, Patient Health Questionnaire; VAS, Visual Analog Scale.
[a]Values are expressed as No. (%).
[b]Values are expressed as mean (SD).

3.1. Agreement of VAS, HADS, and PHQ-9 with BDI in Order to Measuring Depression Severity in Patients with PD

According to Table 2, among 33 patients in the level of lack of depression or weak depression, 33.3%, 39.4%, and 51.5% were correctly identified based on the single-item VAS, HADS, and PHQ-9, respectively, while 66.7%, 60.6%, and 48.5% were incorrectly identified based on VAS, HADS, and PHQ-9, respectively. Among 30 patients at the level of moderate depression, according to BDI, 33.3%, 23.3%, and 36.7% were correctly identified according to the single-item VAS, HADS and PHQ-9, respectively. However, 66.7%, 76.3%, and 63.3% of these 30 patients were wrongly identified based on VAS, HADS and PHQ-9, respectively. Among

16 patients at the level of severe depression, based on BDI, all of them were also diagnosed with severe depression based on the single-item VAS. Conversely, among these 16 patients, 93.8% and 68.8% were correctly identified according to the HADS and PHQ-9 respectively, whereas 6.2% and 31.2% were wrongly identified, respectively.

3.2. Sensitivity, Specificity, and Positive and Negative Predictive values of Single-Item VAS, and Multi-Item HADS, and PHQ-9 to Identify Patients with PD and Depression in Different Thresholds

According to Table 3, in a moderate or greater threshold, VAS, HADS, and PHQ-9 showed a high sensitivity to identify depression severity (i.e., 92, 96, and 89 cases out of 100 patients at the moderate or greater level of depression, based on BDI using cutoff point of 14, were also at the same level according to VAS, HADS, and PHQ-9). In this threshold, the specificity was 42%, 50%, and 62%, respectively. By increasing the threshold to the severe level, the level of specificity rose to 88, 77, and 88, respectively. In the moderate or greater threshold, according to VAS, HADS, and PHQ-9, 15, 18, and 20 cases out of 100 patients identified with depression according to BDI, were truly depressed, respectively (positive predictive value: VAS = 15%, HADS = 18%, and PHQ-9 = 20%), while most of the patients identified without depression, based on BDI test, also had not depression according to VAS, HADS, and PHQ-9 (negative predictive value: VAS = 98%, HADS = 99%, and PHQ-9 = 98%). However, in the severe level, the positive predictive values were 38%, 28%, and 32%, and the negative predictive values were 96%, 97%, and 94% for VAS, HADS, and PHQ-9, respectively (Table 3).

According to Table 4, the area under the curve applied to measure the efficiency of VAS, HADS, and PHQ-9 to separate patients with and without depression, showed that these tests had significant ability ($P < 0.0001$) to diagnose patients with PD with/without depression, and none of the tests showed any significant difference with the results of BDI to classify patients with PD with/without depression ($P = 0.75$).

4. Discussion

Depression is one of the non-motor symptoms of PD, which has a marked effect on quality of life and daily life activities in such patients. In the rehabilitation settings, suitable and useful tools are necessary to diagnose, screen, and determine the severity of depression in patients with PD (4, 7). Moreover, appropriate assessment tools are required to evaluate the rehabilitation outcomes. The current study evaluated the efficiency of depression single-item test (VAS) and multi-item tests (HADS and PHQ-9) against BDI, as a reference test, to separate patients with PD with/without depression. The efficiency of these tests is not yet investigated together in patients with PD.

Comparison the levels of depression based on BDI with the level of depression based on single-item VAS and multi-item HADS and PHQ-9 showed that PHQ-9 was the best tool to identify the lack or weak (51.5%) and moderated depression (36.7%) in patients with PD, but VAS was a good test to identify severe depression (100%) in such patients. Although both HADS and PHQ-9 were the multi-item tests, similar to BDI, there was a high agreement among them and BDI at the weak and moderate levels of depression. This result may be due to the measurement error observed in all tools, and the difference between patients perception about depression and depression concept considered in the scientific studies (9). In addition, each of these tests asked the depression concept through different questions, among which some were easy and some difficult. For example, Golden et al., reported that HADS questions were more difficult, compared with BDI ones (24). This is more obvious when participants in the study have a lower education (25). Therefore, this result could be explained by the fact that most of the current study participants (74.7%) had a low educational level. In a severe level, just the single-item VAS showed a 100% agreement with BDI; therefore, it can be generally suggested that the single-item VAS is the best tool to identify patients with PD and severe depression.

Also, sensitivity and specificity, as well as positive and negative predictive values for the 2 thresholds of moderate or greater and severe depression were calculated for the single-item VAS and multi-item HADS and PHQ-9 using BDI (at the cutoff point of 14) as a criterion value. The results showed that probably the best threshold for both single-item VAS and multi-item HADS and PHQ-9 to identify people with depression depends on the context in which these scales are used. The results of the current study showed that the moderate or greater threshold had a high sensitivity to single-item VAS and multi-item HADS and PHQ-9 (i.e., VAS, HADS, and PHQ-9 had the ability to identify depression in 92, 89, and 96 cases out of 100 persons identified with depression based on BDI). However, in this threshold, the specificity was very low for the 3 scales; therefore, VAS, PHQ-9, and HADS correctly identified only 42, 62, and 50 cases out of 100 persons without depression based on BDI, respectively, and they respectively identified other 58, 28, and 50 persons with depression, which are considered as false-positive. This result showed that this threshold was suitable for the second level evaluation of screening to omit false-positive. By increasing the threshold for all the 3 scales, the specificity also increased (i.e., among 100 patients identified at severe level of depression based on BDI, 88, 88, and 77 cases did not have depression according

Table 2. Depression Severity on VAS, HADS, and PHQ-9 Compared with the BDI in Patients with Parkinson Disease (N = 79)[a]

Scale	Severity of Depression	Depression Classification Based on BDI			
		No or Mild Depression: 0 - 16, N = 33	Moderate Depression: 17 - 29, N = 30	Severe Depression: 30 - 63, N = 16	Total, N = 79
VAS	No or mild depression: 0 - 45	11 (33.3)	4 (13.3)	0 (0)	15 (18.99)
	Moderate depression: 45 - 58	17 (51.5)	10 (33.3)	0 (0)	27 (34.18)
	Severe depression: 59 - 100	5 (15.2)	16 (53.4)	16 (100)	37 (46.83)
HADS	No or mild depression: 0 - 7	13 (39.4)	1 (3.3)	1 (6.2)	15 (18.99)
	Moderate depression: 8 - 10	9 (27.3)	7 (23.3)	0 (0)	16 (20.25)
	Severe depression: 11 - 21	11 (33.3)	22 (73.4)	15 (93.8)	48 (60.76)
PHQ-9	No or mild depression: 1 - 9	17 (51.5)	5 (16.7)	0 (0)	22 (27.85)
	Moderate depression: 10 - 14	12 (36.4)	11 (36.7)	5 (31.2)	28 (35.44)
	Severe depression: 15 - 27	4 (12.1)	14 (46.6)	11 (68.8)	29 (36.71)

Abbreviations: BDI, Beck Depression Inventory; HADS, Hospital Anxiety and Depression Scale; PHQ-9, Patient Health Questionnaire; VAS, Visual Analog Scale.
[a]Values are expressed as No. (%).

Table 3. Accuracy of Different Thresholds for the Single-item VAS, HADS, and PHQ9 Against the Beck Criterion Score in Patients with Parkinson Disease (N = 79)

Scale	Severity of Depression	Sensitivity (95% CI)	Specificity (95% CI)	Positive Predictive Value (95% CI)	Negative Predictive Value (95% CI)
VAS	Moderate depression or greater	92 (81.8 - 97.9)	42 (23.4 - 63.1)	15 (6.4 - 28.3)	98 (85.2 - 100)
	Severe depression	64 (49.8 - 76.9)	88 (69.8 - 97.6)	38 (13.9 - 67.9)	96 (87.6 - 99.2)
PHQ-9	Moderate depression or greater	89 (77 - 95.7)	62 (40.6 - 79.8)	20 (8.6 - 37.6)	98 (88.5 - 100)
	Severe depression	49 (35.1 - 63.2)	88 (69.8 - 97.6)	32 (9.3 - 63.9)	94 (85.3 - 98.3)
HADS	Moderate depression or greater	96 (87 - 99.5)	50 (29.9 - 70.1)	18 (7.7 - 32.2)	99 (88.7 - 100)
	Severe depression	79 (65.9 - 89.2)	77 (56.4 - 91)	28 (11.2 - 50.2)	97 (88.7 - 99.7)

Abbreviations: HADS, Hospital Anxiety and Depression Scale; PHQ-9, Patient Health Questionnaire-9; VAS, Visual Analog Scale.

Table 4. The Results of ROC Analysis to Perform VAS, HADS, and PHQ9 Against the Beck Criterion Scale to Detect Depression in Patients with Parkinson Disease (N = 79)

Scale	Area Under the Curve, Compared with Reference Line			AUC Difference Between Index Tests (VAS, HADS, PHQ-9) and Criterion Test (BDI)		
	AUC (95% CI)	Z	P value	Mean Difference	Z	P value
VAS	0.84 (0.74 - 091)	7.23	< 0.0001	0.04	0.75	0.45
HADS	0.87 (0.78 - 0.93)	9.66	< 0.0001			
PHQ-9	0.85 (0.75 - 0.92)	7.19	< 0.0001			

Abbreviations: AUC, Area Under Curve; BDI, Beck Depression Inventory; HADS, Hospital Anxiety and Depression Scale; PHQ-9, Patient Health Questionnaire-9; VAS: Visual Analog Scale.

to VAS, HADS and PHQ-9, respectively). But, the sensitivity markedly decreased in this threshold (i.e., severe threshold), that is among 100 patients identified at severe level of depression based on BDI, only 65, 49, and 79 cases were also identified at the same level of depression according to VAS, HADS, and PHQ-9, respectively. Therefore, this threshold may be suitable when there are not enough resources for the second stage screening, but some studies suggested that this level of sensitivity was clinically unusable.

The results of the current study showed that both in moderate or greater and severe thresholds, the positive predictive values were very low for all the 3 tests; therefore, in the moderate or greater threshold, the positive predictive values of VAS, PHQ-9, and HADS were 15%, 20%, and 18%, respectively, and 38%, 32%, and 28%, respectively, in the severe threshold. This result showed that among every 100

patients, 15, 20, and 18 cases, according to moderate or greater threshold, and 38, 32, or 28 cases according to severe threshold, really had depression and 75, 80, and 82 or 62, 68 and 73 cases were false-positive. Therefore, the current study results showed that after positive diagnosis of patients in the first level of evaluation based on BDI, using another tool such as standard diagnostic tools or expert therapists is necessary to accurately measure depression in patients with PD in the second level of evaluation. Also, the results of the current study showed that the negative predictive values of VAS, HADS, and PHQ-9 were very high (higher than 90%) in both thresholds. Thus, through these tests, about 1 of 10 patients not identified with depression, based on BDI, may have depression.

Studies on the importance of using single-item scales against multi-item standard tools showed that increasing the items to 2 or more resulted in increasing the accuracy (26), while in the current study it was observed that both single-item and multi-item scales had the same ability to identify patients with depression, compared with BDI. Therefore, both single-item and multi-item scales had marked ability to separate patients with PD with/without depression. This result may be due to the effect of disease, culture, and concepts about depression in different communities.

Some of the limitations of the study were the small sample size and the low educational level of most of the patients, which may affect the results, and it is suggested to consider these limitations in more detailed investigations on these tools in the future studies.

4.1. Conclusion

The results of the current study showed that just the single-item VAS had a complete agreement with BDI to identify people with severe depression. None of the single-item VAS and multi-item HADS and PHQ-9 alone could accurately identify patients with PD and depression, and there is a need for a more accurate standard tool. These results indicated that it was better to use different tests to diagnose and determine the severity of depression in rehabilitation settings. Also, more detailed investigation on the sensitivity of the depression measurement tools after rehabilitation, especially after occupational therapy interventions, is suggested in further studies.

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References

1. Liu CC, Li CY, Lee PC, Sun Y. Variations in Incidence and Prevalence of Parkinson's Disease in Taiwan: A Population-Based Nationwide Study. *Parkinsons Dis.* 2016;**2016**:8756359. doi: 10.1155/2016/8756359. [PubMed: 26904358].
2. Daneshjoo F, Azad A, Mandehgary M, Mehdizadeh M, Taghizadeh G. Correlation between lower and higher order sensory functions and manual dexterity in dominant and non-dominant hand of patients with idiopathic Parkinson's disease. *J Basic Clin Pathophysiol.* 2016;**4**(2):27–36. doi: 10.22070/jbcp.2016.368.
3. Fereshtehnejad SM, Shafieesabet M, Rahmani A, Delbari A, Lokk J. Medium-to-high prevalence of screening-detected parkinsonism in the urban area of Tehran, Iran: data from a community-based door-to-door study. *Neuropsychiatr Dis Treat.* 2015;**11**:321–32. doi: 10.2147/NDT.S77391. [PubMed: 25709455].
4. Schrag A, Barone P, Brown RG, Leentjens AF, McDonald WM, Starkstein S, et al. Depression rating scales in Parkinson's disease: critique and recommendations. *Mov Disord.* 2007;**22**(8):1077–92. doi: 10.1002/mds.21333. [PubMed: 17394234].
5. Lepine JP, Briley M. The increasing burden of depression. *Neuropsychiatr Dis Treat.* 2011;**7**(Suppl 1):3–7. doi: 10.2147/NDT.S19617. [PubMed: 21750622].
6. Mathers C. The global burden of disease: 2004 update. World Health Organization; 2008.
7. Corson K, Gerrity MS, Dobscha SK. Screening for depression and suicidality in a VA primary care setting: 2 items are better than 1 item. *Am J Manag Care.* 2004;**10**(11 Pt 2):839–45. [PubMed: 15609737].
8. Saeidi Borujeni M, Taghizade G, Abdollvahab M, Lajavardi L, Ramezani M. Comparison of a single-item borg scale with the JRPD scale for detecting subjects exposed to injurious work activities in military men with non-specific low back pain [In Persian]. *J Modern Rehabil.* 2015;**9**(4):39–47.
9. Carey M, Jones KA, Yoong SL, D'Este C, Boyes AW, Paul C, et al. Comparison of a single self-assessment item with the PHQ-9 for detecting depression in general practice. *Fam Pract.* 2014 doi: 10.1093/fampra/cmu018. [PubMed: 24839267].
10. Rattray J, Jones MC. Essential elements of questionnaire design and development. *J Clin Nurs.* 2007;**16**(2):234–43. doi: 10.1111/j.1365-2702.2006.01573.x. [PubMed: 17239058].
11. Yohannes AM, Dodd M, Morris J, Webb K. Reliability and validity of a single item measure of quality of life scale for adult patients with cystic fibrosis. *Health Qual Life Outcomes.* 2011;**9**:105. doi: 10.1186/1477-7525-9-105. [PubMed: 22117573].
12. de Oliveira GN, Lessa JM, Goncalves AP, Portela EJ, Sander JW, Teixeira AL. Screening for depression in people with epilepsy: comparative study among neurological disorders depression inventory for epilepsy (NDDI-E), hospital anxiety and depression scale depression subscale (HADS-D), and Beck depression inventory (BDI). *Epilepsy Behav.* 2014;**34**:50–4. doi: 10.1016/j.yebeh.2014.03.003. [PubMed: 24681386].
13. Pourghayoomi E, Negahdar F, Shahidi G, Hassani Mehraban A, Ebrahimi I, Taghizade G, et al. Correlation between functional balance and mobility tests and postural sway measures in dual task paradigm in Parkinson's disease (a pilot study). *J Basic Clin Pathophysiol.* 2014;**2**(2):1–12.
14. Sagar SP, Brown PM, Zelt DT, Pickett WL, Tranmer JE. Further clinical validation of the walking impairment questionnaire for classification of walking performance in patients with peripheral artery disease. *Int J Vasc Med.* 2012;**2012**:190641. doi: 10.1155/2012/190641. [PubMed: 22919494].
15. Kindler CH, Harms C, Amsler F, Ihde-Scholl T, Scheidegger D. The visual analog scale allows effective measurement of preoperative anxiety and detection of patients' anesthetic concerns. *Anesth Analg.* 2000;**90**(3):706–12. doi: 10.1097/00000539-200003000-00036. [PubMed: 10702461].

16. Whelan-Goodinson R, Ponsford J, Schonberger M. Validity of the Hospital Anxiety and Depression Scale to assess depression and anxiety following traumatic brain injury as compared with the Structured Clinical Interview for DSM-IV. *J Affect Disord.* 2009;**114**(1-3):94–102. doi: 10.1016/j.jad.2008.06.007. [PubMed: 18656266].
17. Montazeri A, Vahdaninia M, Ebrahimi M, Jarvandi S. The Hospital Anxiety and Depression Scale (HADS): translation and validation study of the Iranian version. *Health Qual Life Outcomes.* 2003;**1**:14. doi: 10.1186/1477-7525-1-14. [PubMed: 12816545].
18. Kroenke K, Spitzer RL. The PHQ-9: A new depression diagnostic and severity measure. *Psychiatr Ann.* 2002;**32**(9):509–15. doi: 10.3928/0048-5713-20020901-06.
19. Smarr KL, Keefer AL. Measures of depression and depressive symptoms: Beck Depression Inventory-II (BDI-II), Center for Epidemiologic Studies Depression Scale (CES-D), Geriatric Depression Scale (GDS), Hospital Anxiety and Depression Scale (HADS), and Patient Health Questionnaire-9 (PHQ-9). *Arthritis Care Res (Hoboken).* 2011;**63 Suppl 11**:S454–66. doi: 10.1002/acr.20556. [PubMed: 22588766].
20. Falavigna A, Righesso O, Teles AR, Baseggio N, Velho MC, Ruschel LG, et al. Depression Subscale of the Hospital Anxiety and Depression Scale applied preoperatively in spinal surgery. *Arq Neuropsiquiatr.* 2012;**70**(5):352–6. doi: 10.1590/S0004-282X2012000500009. [PubMed: 22618787].
21. Adewuya AO, Ola BA, Afolabi OO. Validity of the patient health questionnaire (PHQ-9) as a screening tool for depression amongst Nigerian university students. *J Affect Disord.* 2006;**96**(1-2):89–93. doi: 10.1016/j.jad.2006.05.021. [PubMed: 16857265].
22. Farinde A. The beck depression inventory. *J Pharm Innov.* 2013;**2**(1).
23. Schrag A, Jahanshahi M, Quinn NP. What contributes to depression in Parkinson's disease? *Psychol Med.* 2001;**31**(1):65–73. doi: 10.1016/j.jad.2006.10.020. [PubMed: 11200961].
24. Golden J, Conroy RM, O'Dwyer AM. Reliability and validity of the Hospital Anxiety and Depression Scale and the Beck Depression Inventory (Full and FastScreen scales) in detecting depression in persons with hepatitis C. *J Affect Disord.* 2007;**100**(1-3):265–9. doi: 10.1016/j.jad.2006.10.020. [PubMed: 17156850].
25. Williams JJ, Pignone M, Ramirez G, Perez Stellato C. Identifying depression in primary care: a literature synthesis of case-finding instruments. *Gen Hosp Psychiatry.* 2002;**24**(4):225–37. doi: 10.1016/S0163-8343(02)00195-0. [PubMed: 12100833].
26. Mitchell AJ, Coyne JC. Do ultra-short screening instruments accurately detect depression in primary care? A pooled analysis and meta-analysis of 22 studies. *Br J Gen Pract.* 2007;**57**(535):144–51. [PubMed: 17263931].