

THE SERBIAN VERSION OF THE GERIATRIC DEPRESSION SCALE: RELIABILITY, VALIDITY AND PSYCHOMETRIC FEATURES AMONG THE DEPRESSED AND NON-DEPRESSED ELDERLY

Dragan Stolić¹
Jelena Jović²
Zoran Bukumirić³
Nemanja Rančić⁴
Marina Stolić¹
Dragana Ignjatović-Ristić^{1,5}

UDK: 616.89.454-053.9

- 1 University of Kragujevac, Faculty of Medical Sciences, Kragujevac, Serbia;
- 2 University of Prishtina – Kosovska Mitrovica, School of Medicine, Department of Preventive Medicine, Kosovska Mitrovica, Serbia;
- 3 University of Belgrade, School of Medicine, Institute of Medical Statistics and Informatics, Belgrade, Serbia;
- 4 University of Defense, Medical Faculty, Centre for Clinical Pharmacology, Military Medical Academy, Belgrade, Serbia
- 5 Univeristy of Kragujevac, Faculty of Medical Sciences, Clinical Center Kragujevac, Kragujevac, Serbia

Summary

Introduction: The symptoms of depression which are clinically significant are present among 8 to 16% of older adult population. More than 20 years ago the 30-item Geriatric Depression Scale (GDS-30) was developed. The 15-item GDS-15 is derived from the 30-item GDS and it is one of the most widely used instruments for screening for depression among older adults.

Objective: The aim of the study was to evaluate reliability, validity and the factor structure of the GDS-15 among Serbian elderly population.

Method: Two hundred and forty nine subjects aged 65 and over participated in the study.

Results: The GDS-15 scale was found to have high internal consistency with Cronbach's $\alpha=0.935$, which means that the reliability of the scale is good. The coefficient of test-retest reliability was 0.95. Principal Components Analysis produced 4 factors within the depressed group. The first factor accounted for 36.7% of the variance, the second, third, and fourth accounted for additional variability of 7.8, 7.0, and 6.7%, respectively, accounted for the explanation of 58.2% of the total variance. The score level 3 was found to be the best cut-off point for GDS-15 with sensitivity 87.6 and specificity 87.5. Ranging from 4 to 7, the cut-off scale was also well discriminative. Taking our results and data from the previous research into consideration, our suggestion for the optimal cut-off value is 4.

Conclusion: We can conclude that our results are very similar to the research that has been conducted in other countries so far, and that the results satisfy all the criteria of successful validation. The Serbian version of the GDS will be helpful for screening and treating depressive disorders among this population.

Keywords: Geriatric Depression Scale (GDS-15); Geriatric Depression; validation; elderly population

INTRODUCTION

The major depressive disorder occurs among up to 5% of community-dwelling older adults. The symptoms of depression which are clinically significant as after critical care hospitalizations where the rates are 37% [3–6].

People aged over 60 years, who are often unable to contact their doctor because of co-existing diseases, live alone and in social isolation, therefore there is no one who can recognize symptoms of their depression. The symptoms of the co-existing medical illness, cognitive dysfunction or both may conceal the first symptoms of depression. These things make depression among older people often unrecognized. It is especially important to emphasize that depressed older adults are at an increased risk of suicide. [4,5,7].

More than 20 years ago the 30-item Geriatric Depression Scale (GDS-30) was developed as a self-report instrument for screening for clinical depression among the elderly population. As the GDS was created for the elderly, the items were particularly created to reflect and detect the characteristics of depression among the elderly. The 15-item GDS-15 is derived from the 30-item GDS [8–9] and is one of the most widely used instruments for screening for depression among older adults [10]. The authors of the original studies did not recommend a clear cut-off value for the 15- and the 30-item versions of the GDS. The GDS may be used with healthy, medically ill and mild to moderately cognitively impaired older adults. [11]. The GDS-15 has been translated into 11 languages and validated in Brazil [4], China [12], the UK [13], the

Netherlands [14], Malaysia [15], etc. In these studies of the GDS-15, the cut-off value of 5 (six studies) or 6 (seven studies) was most frequently used. The lowest cut-off value of 3 was reported among primary care patients [16], and the highest cut-off value of 10 was reported for the slightly modified Mandarin version [17] among primary care patients, and then four studies reported a cut-off value of 7 [18–19]. This is the first validation study of the Geriatric Depression Scale in Serbian language.

AIM

The aim of the study was to evaluate reliability, validity and factor structure of the GDS-15 among Serbian elderly population.

METHOD

The study was conducted at the Psychiatric Ward of the Clinical Centre “Kragujevac” in Serbia. The Clinical Centre in Kragujevac accommodates the need of the population of approximately 2 million people. There are 1.300 beds in this university hospital where 50,000 inpatients are annually admitted, and 400.000 are examined. All patients were of Serbian origin from the same “region of Šumadija”. This region was chosen because one third of the population of Serbia’s inhabitants includes 23.68% of people over the age of 60 [20].

The first step was to translate the GDS-15 into Serbian. In the translation from English to Serbian, the person who translated the GDS was a native Serbian speaker, whereas the person who translated from Serbian to English was a native En-

glish speaker. All GDS-15 items proved to be easily translatable and no problems emerged during the translation procedure. Both versions of the GDS-15 scale (the original English and the new Serbian version) are shown in the appendix.

After that, two groups were formed: depressed and non-depressed subjects. The diagnosis of depression was reached by the consensus of two psychiatrists with experience in the field of the old age psychiatry. Depressed patients fulfilled MDD criteria according to ICD 10 [21], for at least 2 weeks. The control group consisted of individuals who did not meet criteria for major depressive disorder. Patients from the control group were recruited from the general population. Healthy subjects of the control group were recruited from the sub-population of the retired and employed individuals, with different vocations, residing in urban or rural areas that fulfilled the inclusion criteria. All subjects of the control group live in the region of Šumadija and they were directly invited to participate in the study according to their characteristics that could be matched with the study group.

The ethical approval was obtained from the local ethics committee. The written informed consent was obtained from all participants.

As previously mentioned, the longer version GDS-30 was shortened to GDS - 15 for easier use and better acceptability [22,23,24], and shows the strongest correlation with depressive symptoms. Respondents were asked to indicate whether they have experienced the symptoms described during the past week using the yes/no format (rated 1 or 0). Out of 15 items, 10 indicated the presence of depression when their answers were positive,

while the rest (question number 1, 5, 7, 11, 13) indicated depression when their answers were negative. [25].

The subjects completed the social-demographic query (gender, age, marital status). All of them went through a detailed neuropsychological and psychometric assessment which included the Mini-Mental State Examination (MMSE). Earlier researches showed that the involvement of subjects with cognitive deficiency had considerable gaps as well as the fact that the precision of GDS scale is in this case lower. Thus, subjects with Mini-Mental State score lower than 14 were excluded from the study sample. [26,27,28,29].

Participants also completed the Hamilton Depression Rating Scale (HDRS) [30] as well as the Beck Depression Inventory version I (BDI-I) [31,32].

The complete statistical analysis was performed using the computer program IBM SPSS Statistics 19.0. All continuous variables (age, scores of scales) are shown in the form of the mean \pm standard deviation, while the categorical variables (gender, marital status) are shown with the percentage of certain category frequency. The correlation between the two continuous variables was examined by Pearson linear correlation or Spearman rank correlation.

Cronbach's alpha, split-half and test-retest methods of reliability were used. For the evaluation of the validity of this scale, the Varimax Normalized Rotation was applied and the criterion for the number of the extracted components was Eigenvalue > 1 . The factor loading of 0.4 or greater was considered.

To assess the GDS-15 measure characteristics, the scale's sensitivity, specificity

and discrimination capacity were determined by the use of the Receiver Operator Characteristic Curve 12 (ROC). ROC was generated to visualize the sensitivity and specificity of depression scores.

RESULTS

The study sample was composed of 249 aged 65 and over, who signed the consent. Out of those subjects, one hundred and two were depressed (63 females and 29 males) and one hundred and forty seven were non-depressed (86 females and 61 males).

The difference of average age and frequency of marital status and gender between both groups was not statistically significant (Table 1).

The GDS-15 scale was found to have high internal consistency with Cronbach's alpha=0.935, which means that the reliability of the scale is good. The coefficient of test-retest reliability was 0.95.

Principal Components Analysis produced 4 factors within the depressed group. The first factor accounted for 36,7% of the variance, the second, third, and fourth accounted for additional variability of 7,8, 7,0, and 6,7%, respectively, accounted for the explanation of 58.2% of the total variance (Table 2). The values of Cronbach's alpha for these four factors were 0.871. The first factor could be described as a depressive thought content factor (cognitive factor) and was the best factor out of the analyses of four factors. The second factor could be described as a depressed mood factor, the third one was concerned with social isolation and functioning and the fourth one was con-

cerned with feelings of helplessness and fear of the future (Table 2).

Considering criterion validity, GDS mean scores were compared between the depressed (9.63 ± 4.22) and the non-depressed (1.50 ± 1.44) groups, and there was a statistically significant difference ($p < 0.001$) (Table 3). There is also a significant statistical difference among all questions on the GDS between the subject groups. There is a significant statistical difference among total scores on the MMSE, BDI and HAMD between the subject groups.

We have found the Pearson correlation coefficient between GDS-15 and the scores of other instruments (BDI and HAMD) in the total sample. Moreover, we found a very strong positive correlation between GDS-15 and BDI ($r=0.86$; $p < 0.05$) and HAMD ($r=0.86$; $p < 0.05$).

The score level 3 was found to be the best cut-off point for GDS-15 with Sensitivity 87.6 and Specificity 87.5 (Table 4 and Graph 1). Ranging from 4 to 7, the cut-off scale was also discriminative.

DISCUSSION

Using different statistical methods to evaluate reliability and validity, the results of previous researches showed that the GDS has excellent properties as an instrument to screen and measure depression among the elderly.

Using the factor analysis, we have found a 4-factor solution that explains 58.2% of the total variance. The first factor had the highest correlation with depression and accounted for nearly 50% of the variance in the model (Eigenvalue > 1). The main factorial weight of the

component 1, is given by items 2, 3, 4, 5, 12 and 14, and this component can be described as a factor of depressive mood. This result is similar to the results from other studies, i.e. to those conducted in Greece [26]. However, a five-factor solution is also reported (depressed mood, lack of energy, euthymic mood, agitation and social isolation), explaining 42.9% of the total variance [22]. This finding is also similar to the one which is the result of the current study. However, this sort of analysis differs greatly from the results gained from the research conducted among the elderly in China [33]. These results are not surprising considering the cultural and social differences between the countries.

The component of depressive mood gains most factorial weight from the questions 4, 2 and 14, and then from questions 12, 3 and 5. These results coincide with the fact that pension and worsening of one's health are followed by the lack of general activity, the loss of will for everyday activities, difficulties in making new friends that lead to greater social isolation and the loss of the quality of life. That leads to depressive symptoms.

Cronbach's alpha obtained in the present study is compatible with a large number of depression rating scales currently available for the use in clinical and research settings. Also, the high value of the coefficient test-retest reliability (0.95) is consistent with previous studies [34].

Our results showed a strong positive correlation between BDI and GDS-15 mean scores and between HAMD and GDS-15 mean scores within the whole sample [35]. HAMD and BDI scales were previously standardized in Serbia. Follo-

wing the trends of the recent research, all the participants answered the questions of both scales and our results show a strong positive correlation between the results of these scales and the GDS-15 scale. That confirms that GDS-15 is a good instrument for measurement.

We found intriguing results during the evaluation of the optimal cut-off score. The best discriminative value which is determined within the whole sample is the cut-off value over 3. In regard to those values, the added values of sensitivity ($S_n=87.6$) and specificity ($S_p=87.5$) are the highest ones and equal 175.1. However, the cut-off scale was also very discriminative for values ranging from 4 to 7. If our results and data from the previous research are taken into consideration, our suggestion for the optimal cut-off value is 4. This cut-off score separates depressed from non-depressed patients. Patients with scores above 4 are depressed.

Similar results were obtained in the research conducted among primary care patients where an optimal cut-off of 3 was found [16], suggesting an optimal cut-off score for GDS-15 of 2/3, and their results were similar to those found in our study. The German version manifests both S_n and S_p approximately 70% and its use is recommended by German 'Geriatric Assessment Working Group' [36]. In the Greek study, the score of 6/7 on the GDS-15 was found to be the optimal cut-off point for diagnosing depression among elderly Greek population with a sensitivity of 92.23 and specificity of 95.24. Kostas et al. suggest that the main reason is the difference between Greek population and Anglo-Saxon populations in symptomatology [25]. According to some Greek

psychiatrist these populations have higher tendency to express inner feelings so this may lead to a necessity for a higher cut-off level when depression is diagnosed [37,38]. In our research we did not use specific instruments that could scientifically confirm our assertion that the difference in the optimal cut-off point is a consequence of cultural and social differences, i.e. this assertion is not just an assumption, which in any case should be proved by additional researches.

Our results should be interpreted within the context of some possible limitations as well as benefits. Firstly, in comparison to some studies [39], the number of respondents is small. The scale itself has its shortcomings. The GDS cannot be a replacement for the diagnostic interview performed by mental health professionals. It does not evaluate suicidal affinities. However, one of the major advantages of the present study was the use of a well-balanced, naturalistic, clinical sample. It also met the limitations of some previous studies [14,16] and included a control group consisted of healthy individuals.

CONCLUSION

In the end, our study showed similar results to the studies conducted in other countries. In addition, it is important to note that GDS satisfies all the criteria of successful validation among Serbian population. The Serbian version of the GDS will be helpful for screening and treating depressive disorders within this population. Moreover, the practical use of GDS goes beyond the psychiatric setting. We hope that in the future this scale may help early diagnosis of latent depression among elderly patients especially within primary care settings since many avoid seeing psychiatrists either because of a perceived stigma or due to failure to recognize the type of the needed help. Since GDS is an easily applicable, short and reliable instrument, which is defined particularly for geriatric population, it also enables physicians with specialties other than psychiatry to assess depressive symptoms among particularly vulnerable population in inpatient settings (orthopedia, cardiology, etc.), in targeted and precise manner.

SRPSKA VERZIJA GERIJATRIJSKE SKALE ZA PROCENU DEPRESIJE: POUZDANOST, VALIDNOST I PSIHOMETRIJSKA SVOJSTVA KOD DEPRESIVNIH I NEDEPRESIVNIH STARIH

Dragan Stolić¹
Jelena Jović²
Zoran Bukumirić³
Nemanja Rančić⁴
Marina Stolić¹
Dragana Ignjatović-Ristić^{1,5}

- 1 Univerzitet u Kragujevcu, Fakultet medicinskih nauka, Kragujevac, Srbija;
- 2 Univerzitet u Prištini – Kosovska Mitrovica, Medicinski fakultet, Katedra za preventivnu medicinu, Kosovska Mitrovica, Srbija;
- 3 Univerzitet u Beogradu, Medicinski fakultet, Institut za medicinsku statistiku i informatiku, Beograd, Srbija;
- 4 Univerzitet odbrane, Medicinski fakultet, Centar za kliničku farmakologiju, Vojnomedicinska akademija, Beograd, Srbija;
- 5 Klinika za psihijatriju, Klinički centar "Kragujevac", Kragujevac, Srbija;

Kratak sadržaj

Uvod: U populaciji starih 8-16 % ima simptome depresije. Skala za procenu depresije kod starih, verzija od 30 pitanja (GDS-30) je konstruisana pre više od 20 godina. Verzija od 15 pitanja (GDS-15) izvedena je iz verzije od 30 pitanja, i jedan je od najčešće korišćenih instrumenata za skrining depresije kod starih.

Cilj: Cilj studije je bio da se utvrdi pouzdanost, validnost i faktorska struktura GDS-15 skale.

Metod rada: Dve stotine četrdeset ispitanika starosti 65 i više godine je učestvovalo u studiji.

Rezultati: GDS-15 skala ima visoku unutrašnju konzistenciju sa Kronbah alfa =0,935, što znači da je pouzdanost skale dobra. Test-retest koeficijent je bio 0,95. Višefaktorska analiza pokazala je 4 faktora u grupi depresivnih. Prvi faktor objašnjava 36,7% varijanse, drugi, treći i četvrti objašnjavaju 7,8, 7,0, i 6,7%, što ukupno čini objašnjenje 58,2% ukupne varijanse. Skor 3 se pokazao kao najbolja cut-off tačka za GDS-15 sa senzitivnošću 87.6 i specifičnošću 87.5. Međutim i skorovi od 4 do 7, kao cut-off tačke su se pokazali dobro diskriminativnim. Ako uzmemo u obzir naše rezultate i rezultate dosadašnjih istraživanja naš je predlog da cut-off tačka bude na 4.

Zaključak: Naši rezultati u skladu su sa rezultatima dosadašnjih sličnih istraživanja, sprovedenih u drugim državama. Kao takvi zadovoljavaju sve kriterijume uspešne validacije. Smatramo da će srpska verzija GDS-15 skale biti od pomoći za skrining i lečenje depresivnih poremećaja u ovoj populaciji.

Ključne reči: Geriatric Depression Scale (GDS-15); depresija kod starih; validacija; stari

Appendix. Geriatric Depression Scale – the original English and the new Serbian version (Answer: Yes = 0; No = 1)

No.	Questions
1	Da li ste zadovoljni svojim životom? Are you basically satisfied with your life?
2	Da li ste odustali od mnogih aktivnosti i interesovanja? Have you dropped many of your activities and interests?
3	Da li osećate da je vaš život prazan? Do you feel that your life is empty?
4	Da li vam je često dosadno? Do you often get bored?
5	Da li ste uglavnom dobro raspoloženi? Are you in good spirits most of the time?
6	Da li se plašite da će vam se dogoditi nešto loše? Are you afraid that something bad is going to happen to you?
7	Da li se osećate srećnim većinu vremena? Do you feel happy most of the time?
8	Da li se često osećate bespomoćnim? Do you often feel helpless?
9	Da li više volite da ostanete kod kuće nego da izlazite i radite nove stvari? Do you prefer to stay at home rather than go out and do new things?
10	Da li smatrate da imate više teškoća sa pamćenjem nego drugi? Do you feel you have more problems with your memory than most?
11	Da li mislite da je divno živeti danas? Do you think it is wonderful to be alive now?
12	Da li se sada osećate prilično beskorisno? Do you feel pretty worthless the way you are now?
13	Da li se osećate kao da ste puni energije? Do you feel full of energy?
14	Da li smatrate svoju situaciju beznadežnom? Do you feel that your situation is hopeless?
15	Da li mislite da većina ljudi ima više sreće od vas? Do you think that most people are better than you are?

Table 1. Demographic features of the sample (n=249)

Demographic features		Number (%)		p
		Depressed subjects	Control subjects	
Gender	Male	39 (38)	61 (42)	0.61
	Female	63 (62)	86 (58)	
Marital status	Unmarried	59 (59)	105 (71)	0.13
	Married/partner	2 (2)	2 (1)	
	Single	12(12)	1(1)	
	Relict	27 (27)	39 (27)	
Age, M±SD (years)		71.6±5.3	70.4±6.1	0.11
MMSE, $\bar{x} \pm sd$		24.7 ± 4.6	27.4 ± 3.9	<0.001

Table 2. Principal Components Analysis (Rotated Component Matrix)

	Component			
	Factor 1	Factor 2	Factor 3	Factor 4
GDS 01	0.09	0.72	0.24	0.30
GDS 02	0.62	0.45	0.25	-0.02
GDS 03	0.57	0.45	0.03	0.12
GDS 04	0.74	0.01	0.17	-0.01
GDS 05	0.55	0.03	0.45	0.32
GDS 06	-0.07	0.00	0.28	0.68
GDS 07	0.32	0.31	0.51	0.32
GDS 08	0.28	0.22	0.49	0.35
GDS 09	-0.10	0.44	0.70	-0.07
GDS 10	0.28	-0.04	0.66	0.14
GDS 11	0.15	0.57	0.13	0.39
GDS 12	0.58	0.30	0.46	0.02
GDS 13	0.27	0.66	0.09	-0.09
GDS 14	0.62	0.23	0.04	0.30
GDS 15	0.39	0.29	-0.11	0.65
Variance Explained (%)	36.7	7.8	7.0	6.7
Total Variance Explained (%)				58.2

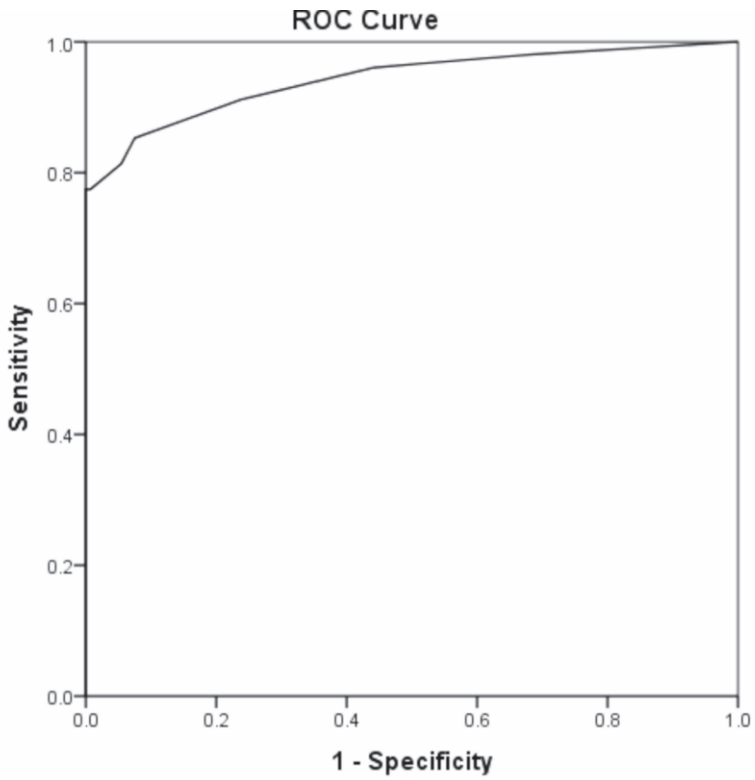
Factor 1 – The first factor could be described as a depressive thought content factor (cognitive factor); Factor 2 – The second factor as a depressed mood factor; Factor 3 – The third one is concerned with social isolation and functioning; Factor 4 – The fourth one is concerned with feelings of helplessness and fear of the future

Table 3. Means and standard deviations of all scale scores in two diagnostic groups

	Depressed subjects		Control subjects		p values
	Mean	SD	Mean	SD	
GDS total score	9.63	4.22	1.50	1.44	<0.001
GDS item 1	0.61	0.49	0.05	0.21	<0.001
GDS item 2	0.72	0.45	0.10	0.30	<0.001
GDS item 3	0.75	0.43	0.02	0.14	<0.001
GDS item 4	0.64	0.48	0.15	0.36	<0.001
GDS item 5	0.71	0.46	0.03	0.18	<0.001
GDS item 6	0.50	0.50	0.01	0.08	<0.001
GDS item 7	0.67	0.47	0.02	0.14	<0.001
GDS item 8	0.71	0.46	0.06	0.24	<0.001
GDS item 9	0.75	0.43	0.48	0.50	<0.001
GDS item 10	0.48	0.50	0.03	0.16	<0.001
GDS item 11	0.61	0.49	0.06	0.24	<0.001
GDS item 12	0.63	0.49	0.03	0.18	<0.001
GDS item 13	0.76	0.43	0.36	0.48	<0.001
GDS item 14	0.44	0.50	0.00	0.00	<0.001
GDS item 15	0.66	0.48	0.09	0.28	<0.001
BDI total score	15.79	7.48	3.44	2.84	<0.001
HAMD 17 total score	12.92	4.96	2.97	2.66	<0.001

Table 4. Sensitivity and Specificity in various score levels of GDS regarding the total sample (the results were showed from the ROC analyses)

Cut-off	Sensitivity	Specificity
>1	96.6	51.9
>2	92.1	71.3
>3	87.6	87.5
>4	84.3	90.0
>5	79.8	94.4
>6	79.8	95.0
>7	75.3	95.0
>8	70.8	95.0
>9	60.7	95.6
>10	53.9	95.6



Diagonal segments are produced by ties.

Graph 1. ROC Curve for various cut-off levels of GDS-15 scale

References:

1. Blazer DG. Depression in late life: review and commentary. *J Gerontol A Biol Sci Med Sci* 2003;58:249-65. PubMed PMID:12634292
2. Lyness JM, Caine ED, King DA, Cox C, Yoediono Z. Psychiatric disorders in older primary care patients. *J Gen Intern Med* 1999;14:249-54. PubMed PMID: 10203638
3. Jackson JC, Pandharipande PP, Girard TD, et al. Depression, post-traumatic stress disorder, and functional disability in survivors of critical illness in the BRAIN-ICU study: a longitudinal cohort study. *Lancet Respir Med* 2014;2:369-79. doi: 10.1016/S2213-2600(14)70051-7; PubMed PMID: 24815803
4. Taylor WD. Clinical practice. Depression in the elderly. *The New England Journal of Medicine*, 2014;371(13):1228-36. doi: 10.1056/NEJMc1402180. PubMed PMID:25251617
5. Milašinović G, editor. Nacionalni vodič dobre kliničke prakse za dijagnostikovanje lečenje depresije. Beograd: Agencija za akreditaciju zdravstvenih ustanova Srbije; 2011.
6. Almeida, O.P. and Almeida S.A. Short versions of the Geriatric Depression Scale: a study of their validity for the diagnosis of a major depressive episode according to ICD-10 and DSM-IV. *International Journal of Geriatric Psychiatry*. 1999 Oct;14(10):858-65. Doi: 10.1002/(SIC)1099-1166(199910)14:10<858::AID-GPS35>3.0.CO;2-8. PubMed PMID: 10521885.
7. Pouget, R., Yersin, B., Wietlisbach, V., Bumann, B. and Büla, C.J.(2000) Depressed mood in a cohort of elderly medical inpatients: prevalence, clinical correlates and recognition rate. *Aging (Milano)*, 2000 Aug;12(4):301-7. PubMed PMID: 11073350.
8. Yesavage, J.A., Brink, T.L., Rose, T.L., Lum, O., Huang, V., Adey, M. et al. Development and validation of a geriatric depression screening scale: a preliminary report. *Journal of Psychiatric Research*. 1982-1983;17(1):37-49. PubMed PMID: 7183759.
9. Brink TL, Yesavage JA, Lum O, Heersema P, Adey M, Rose TL. Screening tests for geriatric depression. *Clin Gerontologist*. 1982-1983;17(1):37-49. PubMed PMID: 7183759.
10. Sheikh, J.I., Yesavage, J.A., Brooks, J.O. 3d, Friedman L., Gratzinger, P., Hill, R.D. et al. Proposed factor structure of the Geriatric Depression Scale. *International Psychogeriatrics* 1991 Spring;3(1):23-8. doi: <http://dx.doi.org.proxy.kobson.nb.rs:2048/10.1017/S1041610291000480>. PubMed PMID: 1863703.
11. Kurlowicz L. The Geriatric Depression Scale (GDS). *Dermatology Nursing*, 6, 14 <http://www.medscape.com/viewarticle/447735>.
12. Boey, K.W. The use of GDS-15 among the older adults in Beijing. *Clinical Gerontologist*. 2000; (21): 49-60. Doi:10.1300/J018v21n02_05.
13. Arthur, A., Jagger, C., Lindesay, J., Graham, C. and Clarke, M. Using an annual over-75 health check to screen for depression: validation of the short Geriatric Depression Scale (GDS15) within general practice. *International Journal of Geriatric Psychiatry*. 1999; (14): 431-39.
14. De Craen, A.J., Heeren, T.J. and Gussekloo J. (2003). Accuracy of the 15-item geriatric depression scale (GDS-15) in a community sample of the oldest old. *International Journal of Geriatric Psychiatry*. 2003 Jan;18(1):63-6. Doi:10.1002/gps.773. PubMed PMID: 12497557.
15. Teh EE. Validation of Malay version of Geriatric Depression Scale among elderly inpatient. 2004; Available from: URL: <http://www.priory.com/psych/MalayGDS.htm>
16. Van Marwijk, H.W., Wallace, P., De Bock, G.H., Hermans, J., Kaptein, A.A. and Mulder, J.D. Evaluation of the feasibility, reliability and diagnostic value of shortened versions of the geriatric depression scale. *British Journal of General Practice*. 1995 Apr;45(393):195-9. PubMed PMID: 7612321.

17. Lam, C.K., Lim, P.P., Low, B.L, Ng, L.L., Chiam, P.C. and Sahadevan S. Depression in dementia: a comparative and validation study of four brief scales in the elderly Chinese. *International Journal of Geriatric Psychiatry*. 2004 May;19(5):422-8. Doi: 10.1002/gps.1098. PubMed PMID: 15156543.
18. Cwikel, J. and Ritchie, K. Screening for depression among the elderly in Israel: an assessment of the Short Geriatric Depression Scale (S-GDS). *Israel Journal of medical sciences*. 1989 Mar;25(3):131-7. PubMed PMID: 2708013.
19. Tang, W.K., Chan, S.S., Chiu, H.F., Wong, K.S., Kwok, T.C., Mok, V. et al. Can the Geriatric Depression Scale detect poststroke depression in Chinese elderly? *Journal of Affective Disorder*, 2004 Aug;81(2):153-6. Doi:10.1016/S0165-0327(03)00163-0. PubMed PMID: 15306141.
20. Statistical office of the Republic of Serbia. *Demographic Yearbook in the Republic of Serbia*, 2011. Belgrade.
21. World Health Organization, *The ICD-10 Classification of Mental and Behavioural Disorders, Diagnostic criteria for research*, Geneva, 1993.
22. Sheikh, J.I. and Yesavage, J.A. (1986). Geriatric depression scale (GDS) recent evidence and development of a shorter version. In T.L. Brink, (Eds). *Clinical gerontology: a guide to assessment and intervention* (pp.165–173) New York: Haworth Press.
23. Alden, D, Austin, C, Sturgeon, R. (1989) A correlation between the Geriatric Depression Scale long and short forms. *Journal of Gerontology*. 1989 Jul;44(4):P124-5. PubMed PMID: 2738314.
24. D'Ath, P, Katona, P, Mullan, E, Evans, S, Katona, C. Screening, detection and management of depression in elderly primary care attenders I: The acceptability and performance of the 15 item Geriatric Depression Scale (GDS15) and the development of short versions. *Family Practice*. 1994 Sep;11(3):260-6. PubMed PMID: 7843514.
25. Available from http://www.casenex.com/casenet/pages/cases/aCure/Geriatric_Depression_Scale.pdf (last visit 21/12/15)
26. Fountoulakis, K.N., Tsolaki, M., Iacovides, A., Yesavage, J., O'Hara, R., Kazis, A. et al. The validation of the short form of the Geriatric Depression Scale (GDS) in Greece. *Aging (Milano)*. 1999 Dec;11(6):367-72. PubMed PMID: 10738851.
27. Folstein, M.F., Folstein, S.E. and McHugh, P.R. "Mini-mental state". A practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Research*. 1975; (3):189-98. Doi: [http://dx.doi.org/10.1016/0022-3956\(75\)90026-6](http://dx.doi.org/10.1016/0022-3956(75)90026-6).
28. Roth M, Tym E, Mountjoy CQ, (1988) Huppert FA. *CAMDEX: The Cambridge examination for mental disorders of the elderly*. Cambridge University Press, pp. 22.
29. Feher, E. P., Larrabee, G. J., Crook, T. H., Factors attenuating the validity of a Geriatric Depression Scale in a dementia population. *Journal of the American Geriatrics Society*. 1992; (40): 906-09.
30. Hamilton, M. Development of a rating scale for primary depressive illness. *The British Journal of Social and clinical Psychology*. 1967 Dec;6(4):278-96. PubMed PMID: 6080235.
31. Beck, A.T., Ward, C.H., Mendelson, M., Mock, J. and Erbauh, J. An inventory for measuring depression. *Archives of General Psychiatry*. 1961;(4):53–63. Doi:10.1001/archpsyc.1961.01710120031004.
32. Ignjatović-Ristić, D., Hinić, D. and Jović, J. (2012). Evaluation of the Beck Depression Inventory in a nonclinical student sample. *West Indian Medical Journal*. 2012 Aug;61(5):489-93. PubMed PMID: 23441370.
33. Lai, D., Tong, H., Zeng, Q. and Xu, W. The factor structure of a Chinese Geriatric Depression Scale-SF: use with alone elderly Chinese in Shanghai, China. *International Journal of Geriatric Psychiatry*. 2010 May;25(5):503-10. Doi: 10.1002/gps.2369. PubMed PMID: 19714685.

34. Malakouti, S.K., Fatollahi, P., Mirabzadeh, A., Salavati, M. and Zandi, T. (2006) Reliability, validity and factor structure of the GDS-15 in Iranian elderly. *International Journal of Geriatric Psychiatry*. 2006 Jun;21(6):588-93. Doi:10.1002/gps.1533. PubMed PMID: 16783767.
35. Rapp SR, Parisi SA, Walsh DA, Wallace CE. Detecting depression in elderly medical inpatients. *J Consult Clin Psychol*. 1988 Aug;56(4):509-13. PubMed PMID: 3198807.
36. Bach, M., Nikolaus, T., Oster, P. and Schlierf G. (1995). Diagnosis of depression in the elderly. The "Geriatric Depression Scale". *Zeitschrift fur Gerontologie und Geriatrie*. 1995 Jan-Feb;28(1):42-6. PubMed PMID: 7773831.
37. Iacovides, A., Maurides, T., Pitsavas, A., Ierodiakonou Ch. Clinical and Demographic Characteristics of Psychogeriatric Patients in the General Hospital. *Archives of Faculty of Medicine of Aristotle University of Thessaloniki*. 1992;(19):57-66.
38. Ierodiakonou Ch, The Greek Family and its Influence on Mental Illness, *Psychoanalytic Psychopathology, Theory and Practice*, Mastoridis Publishing House, Thessaloniki. 1988; 99-108 (in Greek).
39. Bass DS, Attix DK, Phillips-Bute B, Monk TG. An efficient screening tool for preoperative depression: the Geriatric Depression Scale-Short Form. *Anesth Analg*. 2008 Mar;106(3):805-9. doi: 10.1213/ane.0b013e318163fa75.

ACKNOWLEDGMENTS

Hereby the authors would like to express gratitude to the Grant N°175014 and 175007 of the Ministry of Science and Technological Development of The Republic Serbia, out of which this study was partially financed.

The knowledge acquired in the project Research Ethics Education in the Balkans and Black Sea Countries, Fogarty International Program helped in preparation of this article.

Jelena Jović
Rentgenova 6/19
18000 Niš, Srbija
Telephone: +381 63 401 322
E-mail: jovic.jelena@gmail.com