Evaluation of Psychometric Properties of Hindi Versions of Geriatric Depression Scale and Patient Health Questionnaire in Older Adults

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ABSTRACT

Background: A limited number of studies have evaluated the psychometric properties of rating scales used to assess depression in the older adults. The present study aimed to assess the validity of the Hindi Geriatric Depression Scale (GDS, 30, 15, 10, 5, 4, and 1 item version) and Hindi Patient Health Questionnaire (nine and two items version) in a group of older adults residing in a rural community.

Methods: The psychometric properties of these scales were assessed against the diagnosis of depression a qualified psychiatrist made by using a semistructured interview.

Results: Total 125 older adults were recruited from a rural community, with a mean age of 65.5 (SD: 6.4) years. The prevalence of depression was 36.8% as per the evaluation by the psychiatrist. When the agreement of different scales with the clinicians' diagnosis was evaluated, it was seen that sensitivity, specificity, and Cohen Kappa value of GDS-30 and 15 were better than the other scales used to assess depression. When the sensitivity and specificity were evaluated using newer cutoffs, the specificity and sensitivity of GDS-30 were more than that of other scales.

Conclusion: Hindi version of GDS-30 with a cutoff of 13 has excellent psychometric properties.

Keywords: Geriatric Depression Scale, Patient Health Questionnaire, older adults, psychometric properties

Key Messages: The Hindi version of Geriatric Depression Scale-30 items (GDS-30) with a cutoff of 13 has excellent sensitivity and specificity for diagnosing depression. Shorter versions of the GDS (15, 10, 5, 4, and 1 item versions) have lower sensitivity and specificity for the diagnosis of depression when compared to GDS-30. Hindi version of GDS-15 with a cutoff of eight can be considered a second-choice screening instrument for depression among the older adults.

Late-life depression is one of the commonest psychiatric manifestations in the older adults. Depression among the older adults is considered as one of the leading contributors to the disability-adjusted life years (DALYs).[1] In India, the prevalence of depression among elderly in clinical settings vary from 42.4% to 72%, and in community samples, from 0.89% to 6.2%.[2] It is not feasible for mental health professionals to evaluate all the older adults for depression. Hence, there is a need to have screening instruments, which less trained professionals can use to screen the older adults for depression. Various instruments are currently available to screen the older adults for depression. These include Geriatric Depression Scale-30 (GDS-30),[3] GDS-15, which is a short version of GDS-30,[4] Beck Depression Inventory (BDI),[5] the Center for Epidemiologic Studies Depression scale (CES-D) long and short forms,[6,7] Zung Self-rating Depression Scale (SDS),[8] Physical Health Questionnaire-9,[9] etc. Studies from different parts of the world have evaluated the psychometric properties of these instruments against the diagnosis made by clinicians and suggest that these scales have acceptable psychometric properties in the form of reliability, sensitivity, and specificity.[10–12]

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HOW TO CITE THIS ARTICLE: Mehra A, Agarwal A, Bashar M, Grover S. Evaluation of Psychometric Properties of Hindi Versions of Geriatric Depression Scale and Patient Health Questionnaire in Older Adults. *Indian J Psychol Med.* 2021;43(4):319–324.

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Submitted: 16 Aug. 2020
Accepted: 14 May. 2021
Published Online: 28 Jun. 2021

ACCESS THIS ARTICLE ONLINE
Website: journals.sagepub.com/home/szj
DOI: 10.1177/02537176211022159

However, little is understood about how these instruments fare against each other and correlate with each other. Some studies suggest that SDS has a good positive correlation with GDS-30, GDS-15, BDI, and CES-D. However, a few studies found a low correlation with other instruments.[13–15] Due to this, clinicians are often unsure about selecting an appropriate scale to screen the older adults for depression.

The cultural factors also influence the validity of various instruments used to assess depression in the older adults. There is little data from India regarding the validity of various depression screening instruments for the older adults. Sarkar et al.[16] reported that GDS-15 has a receiver operating characteristic (ROC) of 0.659, with a sensitivity and specificity of 80% and 47.6%.[16] In another study, for GDS-15, authors reported Cronbach's alpha value of 0.92, with test–retest reliability of 0.99, sensitivity and specificity of 100% and 88.8%, respectively, and an area under ROC of 0.984.[17] As is evident from this brief literature review, little is understood about how different screening instruments used for evaluating depression among the older adults fare against each other. In this background, the present study aimed to assess the psychometric properties (validity) of different versions of GDS and PHQ-9 in a group of older adults residing in a rural community. It was hypothesized that all the screening instruments would perform similarly.

Material and Method

A cross-sectional study was conducted at a village located in the northern part of India, which comes under the catchment area of a rural community clinic. The study was conducted from June 2019 to August 2019. To be included in the study, study participants were required to be aged ≥60 years, residing in the catchment area, willing to participate in the study, and cooperative enough to participate in an interview with the clinician. People who were very sick, were not cooperative, had cognitive impairment, or had an acute debilitating physical illness and those who did not provide the consent were excluded.

The Institute Ethics Committee approved the study, and the participants were recruited after obtaining written informed consent. Participants were recruited by convenient sampling. Those participants who were found to have a psychiatric illness as per the ICD-10 diagnostic criteria were offered treatment.

Persons aged ≥60 years were identified by a female medical health worker and were explained about the study. Those who agreed to participate were brought to the rural health clinic on a specified day along with a family member who was well versed with the patients' mental and physical health status. At the rural health clinic, the participants were assessed by a qualified psychiatrist who was well-versed in the local language, dialect, culture, traditions, customs, etc. For this study, 148 participants were approached, of which 125 were included in the study. The reasons for exclusion were participants being too sick to be evaluated (n = 20) and refusal of consent (n = 3).

The study participants were assessed on the Hindi version of GDS-30, PHQ-9, and the University of California, Los Angeles Loneliness Scale (UCLA LS) by a health care worker. For those participants who could not read due to various reasons, questions were read aloud, slowly. Additionally, the participants were assessed by a qualified psychiatrist by using a semistructured interview for depression as per the International Classification of Diseases, 10th revision (ICD-10) criteria. The clinical diagnosis was based on the information obtained from the patients, reliable informants, and mental status examination. The psychiatrist who examined the participants was not aware of the scores in the rating scales as assessed by the health care workers. The best estimate approach[18] was used to make a clinical diagnosis of depression.

Geriatric Depression Scale-30 (Long-form): It is a 30-item self-rated questionnaire designed by Yesavageet al.[19] and translated into Hindi by Ganguli et al.[20] The scale has a binary response with "yes" or "no" responses. Each item is rated "0" or "1," with the total score ranging from 0 to 30. A score of ≤9 is considered normal, 10–19 indicates mild depression, and 20–30 indicates severe depression. The scale has been found to have a high sensitivity (92%–100%) and specificity (84%–87%), with a high degree of internal consistency, for identifying depression in the older adults.[19] For this study, a validated Hindi version was used.[20]

Different shorter versions of GDS, that is, GDS-15, GDS-10, GDS-5, GDS-4, and GDS-1 have also been validated and are in use.[10,21–23] Their use in clinical practice is even more attractive, as they can substantially reduce administration time. Test and retest reliability indexes for the short versions are usually acceptable.[11,24] For GDS-15, a score of 0–4 points suggests "no risk of depression," and those who score ≥5 points are considered to be "at risk of depression." GDS-15 has a sensitivity of 92% and a specificity of 81% at a cutoff of 5.[25,26] GDS-10, with a cutoff scores of 4/5, has a sensitivity of 80.5%, a specificity of 78.3%, the positive predictive value of 86.8%, and negative predictive value of 60.2%.[12] For the GDS-4 or GDS-5, cutoff scores of 2 or 3, respectively, have been found to have a sensitivity and specificity of 92.5% (95% CI = 85.5%–97.4%) and 77.2% (95% CI = 66.6%–86.3%), respectively.[12] GDS-1 with a cutoff score of 1, has a low sensitivity (61.0%–63.6%) and a low negative predictive value (56.7%–67.6%).[12,27] Besides, the binary response format in GDS (yes/no) does not indicate the relative intensity or frequency of the depressive symptoms.[28]

Patient Health Questionnaire-9: It is a 9-item self-report questionnaire. Each item is rated on a 4-point scale, that is, 0–3 ("not at all" to "nearly every day"), with a total score ranging from 0 to 27—higher the score, higher the severity of depression. The Cohen kappa value of the scale is 0.65, with a sensitivity of 75% and specificity of 90%.[28] The presence of a score of ≥10 on PHQ-9 is considered an indicator of clinical depression. A short form of PHQ-9 is available as PHQ-2. It has two items with score ranges from 0 to 6. The cutoff score of ≥3 indicates the presence of depression.[29] The Hindi version of the scale, which has been evaluated for its psychometric properties against the clinician diagnosis, was used in the present study.[30,31]

University of California, Los Angeles Loneliness Scale (UCLA LS): UCLA LS comprises 20 items, of which 10 are scored in a straightforward direction and 10 are scored in a reverse direction.[32] Each item is scored on a 4-point Likert scale of 1 to 4. The maximum score that can be obtained

is 80, with a higher score indicating a higher level of loneliness. The scale has good internal consistency (coefficient ranging from 0.89 to 0.94), test–retest reliability (r = 0.73), and adequate convergent and construct validity.[33] For this study, the Hindi-translated version of the scale was used.[34] Three items of the scale (i.e., "lack of companionship," "left out in life," and "isolated from others") are commonly used to assess the prevalence of loneliness, and responses for any of these three items in the form of "sometimes/often" are considered as indicative of the presence of loneliness.[33] The UCLA LS was used to evaluate the discriminant validity of the scales used to assess depression.

Statistical Analysis

Statistical analysis was carried out using the Statistical Package for the Social Science Version 14 (SPSS for Windows, Chicago, SPSS Inc., USA). Descriptive analysis was computed in terms of mean and standard deviation (SD), with range for continuous variables and frequency with percentage for ordinal and nominal variables. Sensitivity and specificity were calculated for different cutoff scores for identifying depression (criterion validity). ROC analysis was also carried out for each version of the GDS and the PHQ scale. Internal consistency of the various versions of the GDS and PHQ were measured using Cronbach's alpha coefficient.

Results

The mean age of the participants was 65.5 years (SD: 6.4; **Table 1**). The mean number of years of education was 1.3 (2.9) years. About two-thirds of the participants were married (64.0%) and were female (62.4%). More than three fourth were from extended/joint family setup. A majority of participants were from lower socioeconomic status (73.6%). More than half of the participants had had at least one chronic physical illness.

The prevalence of depression in the study sample was 36.8%, as per the evaluation by the psychiatrist. The prevalence of depression as per the established cutoffs of GDS-30, GDS-15, and PHQ-9 was 29.6%, 34.4%, and 21.6%, respectively (**Table 2**). About two-thirds (66.4%) of the participants fulfilled the criteria for loneliness.

TABLE 1.

Sociodemographic Characteristics of the Sample (N = 125)

Variables	Frequency (%)/Mean (SD)
Age (in yr)	65.5 (6.4)
Education Literate Illiterate	 28 (22.4%) 97 (77.6%)
Education (in years)	1.3 (2.9) {range: 0–16; median: 0}
Income of the family (in Indian rupees)	2891.2 (2808.5)
Sex Male Female	 47 (37.6%) 78 (62.4%)
Marital status Currently single Married	 45 (36.0%) 80 (64.0%)
Type of family Nuclear Extended/joint	 28 (22.4%) 97 (77.6%)
Socioeconomic status Lower Middle	 92 (73.6%) 33 (26.4%)
Physical illness Present Absent	 55 (44.0%) 79 (56.0%)

Estimates of sensitivity, specificity, and Cohen Kappa value estimated for the different scales using the existing cutoff values against the diagnosis made by the psychiatrist are presented in **Table 3**.

To evaluate the concurrence between the different versions of the GDS and PHQ with each other, we carried out the correlation analysis between the total scores of different-item versions. When the intercorrelations among the different scales were evaluated, it was seen that GDS-30 total score had a significant positive correlation with GDS-15, GDS-10, GDS-5, GDS-4, GDS-1, PHQ-9, and PHQ-2. Additionally, we evaluated the association of different versions of the GDS with the UCLA LS to assess the discriminant validity. While GDS-30, GDS-15, and GDS-5 did have a significant correlation with the UCLA LS, PHQ-9, and PHQ-2, total scores did not (**Table 4**).

Further, an attempt was made to find out if the discriminant validity of the tools could be improved by finding out new cutoff scores for the different scales with the help of ROC curve analysis of the data obtained in the present study, using clinicians' diagnosis as the gold standard. The results (**Table 5**) showed

TABLE 2.

Prevalence of Depression and Loneliness as per the Different Scales and as per the Clinician

Variables	Frequency (%)
Clinical diagnosis of depressive disorder as per ICD-10	46 (36.8%)
Prevalence of depression as per GDS-30 (score of ≥20)	37 (29.6%)
Mean GDS-30 score	12.9 (10.3)
Prevalence of depression as per GDS-15 (score of ≥10)	43 (34.4%)
Mean GDS-15 score [item numbers: 1–4, 7–10, 12, 14, 15, 17, 21–23 of GDS-30]	6.8 (5.1)
Prevalence of depression as per GDS-10 (score of ≥4)	66 (52.8%)
Mean GDS-10 score [item numbers: 1, 2, 7–10, 12,17, 21, 23 of GDS–30]	4.7 (3.5)
Prevalence of depression as per GDS-5 (score of ≥ 2)	73 (58.4%)
Mean GDS-5 score [item numbers: 1,4,8,9,12 of GDS-30]	2.4 (1.8)
Prevalence of depression as per GDS-4 (score of ≥1)	99 (79.2%)
Mean GDS-4 score [item numbers: 1, 2, 9, 12 of GDS-30]	2.0 (1.5)
Prevalence of depression as per GDS-1 (score of ≥1)	76 (60.9%)
Mean GDS-1 score [item numbers: 1 of GDS-30]	0.6 (0.5)
Prevalence of depression as per PHQ-9 (score of ≥10)	27 (21.6%)
Mean score [item numbers: 1,2 of PHQ-9]	5.8 (4.6)
Prevalence of depression as per PHQ-2 (score of ≥3)	24 (19.2%)
Mean score	1.5 (1.2)
Loneliness (as per item 4, 10, 16): present	83 (66.4%)

GDS: Geriatric Depression Scale; PHQ: Patient Health Questionnaire.

TABLE 3.

Estimates of Sensitivity and Specificity of Different Versions of GDS and PHQ Obtained Using Existing Cutoff Values Against Diagnosis Made by the Psychiatrist

Variables	Cutoff Used	Sensitivity	Specificity	Cohen Kappa Value	Cronbach's Alpha
GDS-30	20	65.2%	91.1%	0.589	0.96
GDS-15	10	76.1%	91.1%	0.68	0.92
GDS-10	4	95.7%	72.2%	0.45	0.89
GDS-5	2	95.7%	63.3%	0.52	0.77
GDS-4	1	97.8%	62.0%	0.26	0.85
GDS-1	1	91.3%	57%	0.42	–
PHQ-9	10	47.8%	93.7%	0.45	0.68
PHQ-2	3	43.5%	94.9%	0.43	0.50

GDS: Geriatric Depression Scale; PHQ: Patient Health Questionnaire.

TABLE 4.

Intercorrelation Among Different Versions of GDS and PHQ

Variables	GDS-30	GDS-15	GDS-10	GDS-5	GDS-4	GDS-1	PHQ-9	PHQ-2
GDS-30	XXX							
GDS-15	0.98 (<0.001***)	XXX						
GDS-10	0.96 (<0.001***)	0.97 (<0.001***)	XXX					
GDS-5	0.91 (<0.001***)	0.93 (<0.001***)	0.86 (<0.001***)	XXX				
GDS-4	0.86 (<0.001***)	0.88 (<0.001***)	0.92 (<0.001***)	0.78 (<0.001***)	XXX			
GDS-1	0.61 (<0.001***)	0.66 (<0.001***)	0.69 (<0.001***)	0.67 (<0.001***)	0.67 (<0.001***)	XXX		
PHQ-9	0.58 (<0.001***)	0.56 (<0.001***)	0.55 (<0.001***)	0.51 (<0.001***)	0.56 (<0.001***)	0.56 (<0.001***)	XX	
PHQ-2	0.53 (<0.001***)	0.54 (<0.001***)	0.51 (<0.001***)	0.53 (<0.001***)	0.53 (<0.001***)	0.52 (<0.001***)	0.73 (<0.001***)	XXX
Loneliness scale	0.23 (0.011*)	0.21 (0.017*)	0.16 (0.074)	0.25 (0.005**)	0.13 (0.132)	0.12 (0.173)	0.14 (0.120)	0.05 (0.626)

GDS: Geriatric Depression Scale; PHQ: Patient Health Questionnaire.
***$P < 0.001$

TABLE 5.

Estimates of Sensitivity and Specificity Associated with the New Cutoff Values of GDS and PHQ Obtained Using ROC Curve Analysis of the Data

Variables	Cut off Used	Sensitivity	Specificity	Cohen Kappa Value (95% Confidence Interval)
GDS-30	13	97.8%	91.1%	0.86(0.77–0.95)
GDS-15	8	84.8%	91.1%	0.76 (0.64–0.88)
GDS-10	4	95.7%	72.2%	0.45 (0.33–0.57)
GDS-5	3	87%	87.3%	0.73 (0.62–0.85)
GDS-4	3	80.4%	81%	0.59 (0.45–0.73)
GDS-1	1	91.3%	57%	0.42 (0.29–0.55)
PHQ-9	8	69.6%	87.3%	0.58 (0.43–0.73)
PHQ-2	2	91.3%	67.1%	0.59 (0.45–0.73)

GDS: Geriatric Depression Scale; PHQ: Patient Health Questionnaire.

that for GDS-15, the AUC was 0.925 (95% CI 0.877–0.974), indicating excellent capability to discriminate between persons with depression and without depression in the older adults. The optimal cutoff score with the best sensitivity (84.8%) and specificity (91.1%) for this scale was 8.

For GDS-30, the AUC was 0.92 (95% CI 0.87–0.97), indicating excellent discriminant validity. The optimal cutoff score with the best sensitivity (97.8%) and specificity (91.1%) was found to be 13. For PHQ-9, the AUC showed a value of 0.841 (95% CI 0.76–0.92), indicating moderate capability to discriminate between persons with depression and lack of depression in the older adults. The optimal cutoff value for

this scale was 8, with a sensitivity of 69.6% and specificity of 87.3%.

Discussion

The selection of an appropriate screening questionnaire for assessment of depression in older adults has always been an area of interest. A good screening scale is required to have high sensitivity and high specificity. At present, many scales are used for screening depression among the older adults.[16] However, little is known about how these compare with the diagnosis by a clinician. Accordingly, this study aimed to evaluate the psychometric properties of the Hindi validated versions of GDS (30, 15, 10, 5, 4, and 1 item versions) and PHQ (9 and 2 item versions) in the older adults residing in the community. The present study shows that, when the cutoffs as suggested by the originator of the various scales are used for the older adults, the psychometric properties of these scales appear to be good to excellent. Among the various scales, with the existing cutoffs, GDS-30 appears to have better sensitivity, and specificity. When the psychometric properties of various scales were assessed as per the new cutoffs proposed in the present study, it was seen that all the scales had better sensitivity and specificity compared to the cutoff suggested by the original authors. These differences could be due to cultural factors. Previous studies from India have evaluated the validity of the Tamil version of GDS-15 in a rural area and that of the Kannada version of GDS and have reported good accuracy.[7,8] Our findings add to this Indian literature and suggest excellent psychometric properties of the Hindi version of GDS. The present study shows that shorter versions of GDS have lower sensitivity, although the specificity is comparable for different versions of GDS.

In the present study, when we lowered the cutoff values for GDS-30 and 15, from 20 and 10, respectively, to 13 and 8, respectively, there was an increase in sensitivity without a corresponding decrease in specificity. Though the reason for this finding is not evident from the data, we may take this result to indicate that for the Indian sample under study, lowering the cutoff value as above may result in improved performance of the scale.

Previous studies that evaluated the sensitivity and specificity of PHQ-9 among the older adults found them to be 63% and 82%, respectively.[35] In another study, the sensitivity and specificity were found to be 94% each.[36] Our findings show comparable sensitivity and specificity. However, these increase further if lower cutoffs are used.

Further, in the present study, there was an excellent correlation between GDS-15 and GDS-30. However, correlation of GDS-30 and GDS-15 with PHQ-9 was in the range of a good level of correlation. However, in terms of discriminant validity, PHQ-9 appeared to lack any correlation with the UCLA LS. In contrast, different versions of GDS had a weak correlation, suggesting that, unlike PHQ-9, different versions of GDS are not able to distinguish depression from loneliness.

The present study was limited by a cross-sectional assessment. Further, the study sample was relatively small. The scales were administered by a health worker rather than being self-administered, as the majority of the participants were illiterate. Hence, interviewer bias could not be ruled out. The study was limited to those without cognitive impairment. The diagnosis by the psychiatrist was based on the use of a semistructured interview and not a standardized diagnostic interview. The study participants were recruited by convenient sampling.

Conclusion

The Hindi version of GDS-30 with a cutoff of 13 has excellent psychometric properties in the Indian population. However, it is important to note that administration of GDS-30 is time-consuming and can be tiring for older adults, and it is difficult to administer in an emergency setting. Hence, the Hindi version of GDS-15 with a cutoff of 8 can be considered a second-choice screening instrument for depression among the older adults. Considering the high accuracy of GDS-15 in identifying depression among the older adults and the ease and short time needed to administer it, it may be more suitable for screening and assessing depressive symptoms in older adults, especially while screening larger study samples. The use of further shorter versions leads to a reduction in the sensitivity and specificity. PHQ-9 appears to be inferior to GDS in screening people for depression.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

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References

1. Institute for Health Metrics and Evaluation (IHME). Findings from the Global Burden of Disease Study 2017. Seattle, WA: IHME, 2018.
2. Grover S and Malhotra N. Depression in elderly: a review of Indian research. J Geriatr Ment Health 2015; 2(1): 4–15.
3. Yesavage JA, Brink TL, Rose TL, et al. The Geriatric Depression Rating Scale: comparison with other self-report and psychiatric rating scales. In: Crook T, Ferris S, Bartus R (eds) *Assessment in geriatric psychopharmacology*. New Canaan, Conn: Mark Powley, 1983, pp. 153–167.
4. Yesavage JA and Sheikh JI. 9/Geriatric Depression Scale (GDS) recent evidence and development of a shorter version. Clin Gerontol 1986; 5(1–2): 165–173.
5. Beck AT, Steer RA, and Brown GK. *Manual for the Beck Depression Inventory-II*. San Antonio, TX: Psychological Corporation, 1996.
6. Radloff LS. The CES-D scale: a self-report depression scale for research in the general population. Appl Psychol Meas 1977; 1(3): 385–401.
7. Kohout FJ, Berkman LF, Evans DA, et al. Two shorter forms of the CES-D depression symptoms index. J Aging Health 1993; 5(2):179–193.
8. Zung WWK. A Self-Rating Depression Scale. Arch Gen Psychiatry 1965; 12(1): 63–70.
9. Kroenke K1, Spitzer RL, and Williams JB. The PHQ-9: validity of a brief depression severity measure. J Gen Intern Med September 2001; 16(9): 606–613.
10. Mitchell AJ, Bird V, Rizzo M, et al. Which version of the Geriatric Depression Scale is most useful in medical settings and nursing homes? Diagnostic validity

meta-analysis. Am J Geriatr Psychiatry 2010; 18(12): 1066–1077.
11. Lyness JM, Noel TK, Cox C, et al. Screening for depression in elderly primary care patients: a comparison of the Center for Epidemiologic Studies-Depression Scale and the Geriatric Depression Scale. Arch Int Med 1997; 157(4): 449–454.
12. Almeida OP and Almeida SA: 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. Int J Geriatr Psychiatry 1999; 14: 858–865.
13. Zung WW. The depression status inventory: an adjunct to the self-rating depression scale. J Clin Psychol 1972; 28(4): 539–543.
14. Biggs JT, Wylie LT, and Ziegler VE. Validity of the Zung Self-Rating Depression Scale. Br J Psychiatry 1978; 132(4): 381–385.
15. Hamilton M. A rating scale for depression. J Neurol Neurosurg Psychiatry 1960; 23(1): 56–62.
16. Sarkar S, Kattimani S, Roy G, et al. Validation of Tamil version of short form of Geriatric Depression Scale-15. J Neurosci Rural Pract 2015; 6(3): 442–446.
17. Rajgopal J, Sanjay TV, and Mahajan M. Psychometric properties of Geriatric Depression Scale (Kannada version): a community-based study. J Ger Mental Health 2019; 6(2): 84–87.
18. Kosten TA and Rounsaville BJ. Sensitivity of psychiatric diagnosis based on the best estimate procedure. Am J Psychiatry 1992; 149(9): 1225–1227.
19. Yesavage JA, Brink TL, Rose TL, et al. Development and validation of a geriatric depression screening scale: a preliminary report. J Psychiatr Res 1983; 17: 37–49.
20. Ganguli M, Dube S, Johnston JM, et al. Depressive symptoms, cognitive impairment and functional impairment in a rural elderly population in India: a Hindi version of the Geriatric Depression Scale (GDS-H). Int J Geriatr Psychiatry 1999; 14: 807–820.
21. Castelo MS, Coelho-Fillo JM, Carvalho A, et al. Validity of the Brazilian version of the Geriatric Depression Scale (GDS) among primary care patients. Int Psychogeriatr 2009; 22(1): 109–113.
22. Malakouti SK, Fatollahi P, Mirabzadeh A, et al. Validity and factor structure of the GDS-15 in Iranian elderly. Int J Geriatr Psychiatry 2006; 21(6): 588–593.
23. Mitchell AJ, Bird V, Rizzo M, et al. Diagnostic validity and added value of the Geriatric Depression Scale for depression in primary care: a meta-analysis of GDS30 and GDS15. J Affect Disord 2010; 125(1): 10–17.
24. Shah A, Phongsathorn V, Bielawska C, et al. Screening for depression among geriatric in patients with short versions of the Geriatric Depression Scale. Int J Geriatr Psychiatry 1996; 11(10): 915–918.
25. Nyunt S, Fones C, Niti M, et al. Criterion-based validity and reliability of Geriatric Depression Screening Scale (GDS-15) in a large validation sample of community-living Asian older adults. Aging Ment Health 2009; 13(3): 376–382.
26. Durmaz B, Soysal P, Ellidokuz H, et al. Validity and reliability of Geriatric Depression Scale-15 (short form) in Turkish older adults. North Clin Istanb 2018; 5(3): 216–220.
27. Castle NG and Engberg J. Response formats and satisfaction surveys for elders. Gerontologist 2004; 44(3), 358–367.
28. Kroenke K, Spitzer RL, and Williams JB. The PHQ-9: validity of a brief depression severity measure. J Gen Intern Med 2001; 16(9): 606–613.
29. Kroenke K, Spitzer RL, and Williams JB. The Patient Health Questionnaire-2: validity of a two-item depression screener. Medical Care 2003; 41(11): 1284–1292.
30. Avasthi A, Varma SC, Kulhara P, et al. Diagnosis of common mental disorders by using PRIME-MD Patient Health Questionnaire. Indian J Med Res 2008; 127(2): 159–164.
31. Avasthi A, Grover S, Bhansali A, et al. Presence of common mental disorders in patients with diabetes mellitus using a two-stage evaluation method. Indian J Med Res 2015; 141(3): 364–367.
32. Russell D, Peplau LA, and Ferguson ML. UCLA Loneliness scale. Developing a measure of loneliness. J Personality Assessment 1978; 42: 290–294.
33. Hughes ME, Waite LJ, Hawkley LC, et al. A short scale for measuring loneliness in large surveys. Res Aging 2004; 26(6): 655–672.
34. Grover S, Avasthi A, Sahoo S, et al. Relationship of loneliness and social connectedness with depression in elderly: a multicentric study under the aegis of Indian Association for Geriatric Mental Health. J Geriatr Ment Health 2018; 5(2): 99–106.
35. Costa MV, Diniz MF, Nacimento KK, et al. Accuracy of three depression screening scales to diagnose major depressive episodes in older adults without neurocognitive disorders. Rev Bras Psiquiatr 2016; 38(2): 154–156.
36. Phelan E, Williams B, Meeker K, et al. A study of the diagnostic accuracy of the PHQ-9 in primary elderly. BMC Family Pract 2010; 11: 63.