


Internal Consistency of Yesavage Geriatric Depression Scale (GDS 15-Item Version) in Ecuadorian Older Adults

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Abstract

The present study aimed to assess the validity of a Spanish version of the Geriatric Depression-15 Scale (GDS-15) in Ecuadorian adults. Cross-sectional study to validate GDS-15 in its short version (GDS-15). Internal consistency and factor structure were assessed through Kuder Richardson 20 and Confirmatory Factor Analysis. A total of 211 subjects 65 years of age and older participated in the validation process. Internal consistency was adequate, the Kuder Richardson 20 coefficient for the total scale was 0.73. Three factor structure was found for the scale. This study highlights the importance of having a validated scale for screening depression in the elderly. This study provides an evidence for the use of GDS-15 in Ecuadorian elderly population to screen for depression.

Keywords

Geriatric Depression Scale, elderly, internal consistency, geriatrics, depression

What do we already know about this topic?

The Geriatric Depression Scale (GDS) is an instrument to screen for depression in the elderly. It comprises measurement of affective and behavioral symptoms of depression and excludes most symptoms that may be confused with somatic disease or dementia. It has been validated in different contexts. The scale can identify the possible presence of depression, but it is not an instrument for the diagnosis of depression.

How does your research contribute to the field?

This research has provided a Spanish validated scale for Ecuadorian older adults to use for screening for depression allowing a rapid and correct diagnosis for those who subjects that should be treated to reduce their levels of depression.

What are your research's implications toward theory, practice, or policy?

There was a lack of knowledge in the Ecuador regarding the validity of this scale in geriatric populations. It was demonstrated that it is a useful screening tool in the clinical setting to facilitate assessment of depression in older adults and can be used in the local setting.

Introduction

Depression in older adults is a disorder associated with functional, cognitively, physically, and socially impairments. Older adults have the highest rates of suicide of any age group.¹ Depression is more common in people who also have other illnesses or whose function becomes limited. According to the Centers for Disease Control and Prevention (CDC), some estimates of major depression in older people living in the community range from less than 1% to about 5% but rise to 13.5% in those who require home healthcare and to 11.5% in hospitalized patients.²

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Even this medical condition is a common problem in this population, be depressed is not a normal part of aging. Most older adults feel satisfied with their lives, despite having more illnesses or physical problems according to the National Institute of Aging.³

Globally, the population is ageing rapidly, between 2015 and 2050, the proportion of the world's population over 60 years will nearly double, from 12% to 22%. Mental and neurological disorders among older adults account for 6.6% of the total disability (DALYs) for this age group. Approximately 15% of adults aged 60 and over suffer from a mental disorder. The most common mental and neurological disorders in this age group are dementia and depression, which affect approximately 5% and 7% of the world's older population, respectively. Depression can cause great suffering and lead to impaired functioning in daily life.⁴ In Ecuador 64% of the people who was diagnosed with depression were female. The highest prevalence of depression was in the age range from 19 to 59 years with 73.5% of cases. A report from the World Health Organization (WHO) indicates that Ecuador is the country with most cases of depression occupying the 11th place in Latin America.⁵

According to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) a major depressive episode (MDE) requires the presence of 5 or more symptoms within a 2 weeks period and at least 1 of the symptoms should be either (1) depressed mood or (2) loss of interest or pleasure.⁶ Secondary symptoms include significant weight loss when not dieting or weight gain, or decrease or increase in appetite, sleep difficulties, psychomotor agitation or retardation, fatigue or loss of energy, diminished ability to think or concentrate, feelings of worthlessness or excessive guilt, and suicidality.⁶ According to DSM-5 criteria, major depression symptoms are best represented by somatic and non-somatic factors.⁶ The somatic factors are sleeping difficulties, appetite disorders, poor concentration, fatigue, and psychomotor agitation/retardation and the non-somatic factors includes depressed mood, anhedonia, feelings of worthless, and thoughts of death. The severity of depression is assessed with depression scales, such as the Hamilton Depression Rating Scale (HAMD).⁶ The depressed mood is the most reliable DSM-5 symptom to discriminate moderate depression from non-depression while anhedonia is an important criterion when depression becomes more severe.⁶

The Geriatric Depression Scale (GDS) is an evaluation tool to diagnose older adult's depression and expresses degree of satisfaction, quality of life and feelings and its short form (GDS-15) is a widely used depression rating scale for elderly adults. This questionnaire was developed by Yesavage et al in 1982⁷ and it considered as a basic screening measure for depression in older adults. In its larger version GDS is composed of 30 items; instrument developed from 100 popular questions and excludes somatic and psychotic symptoms.⁸ GDS is defined a self-report scale. In its original version, the score goes from 0 (not depressed) to 30 (serious

depression) with a cut-off at score 11 in the original version. The average of the scale's sensitivity is 0.753 while the specificity's one is 0.770 (S: 84% E: 95%).^{8,9} In its short version, of the 15 items, 10 indicate the presence of depression when answered positively while the other 5 are indicative of depression when answered negatively. This form can be completed in approximately 5 to 7 minutes, making it ideal for people who are easily fatigued or are limited in their ability to concentrate for longer periods of time.⁷

Cultural factors may affect the reliability or validity of the GDS. The objective of this study was to determine the internal consistency and explore factor structure of a Spanish GDS-15 construct for screening for major depression in Ecuadorean older adults.

Methods

Study Design

Observational, cross-sectional study. Validation of a Spanish version of GDS-15.

Participants

The inclusion criteria for the group were age ≥ 65 and subjects who consented to participate. We included both in and outpatients from a geriatric health institution Hospital de Atención Integral del Adulto Mayor of Quito, Ecuador. Subjects with diagnosis of dementia, with moderate to severe cognitive impairment or terminally ill patients were excluded from the study because of the most of these subjects could exhibit difficulties in verbal memory or reasoning and they were not able to complete the study.

Sample Size

A sample of 211 subjects were included to assess the validity of GDS scale in its 15-item version. The sample met the criteria by Cochran formula more than 10 times of questionnaire items.¹⁰

Measurement Instrument

The GDS-15 has a dichotomous (yes or no) response pattern and its items investigate only symptoms of cognitive disorders of a major depressive episode during the last 15 days (it excludes somatic depressive symptoms such as sleeping difficulties, appetite disorders, poor concentration, fatigue among others). The score of this scale ranges from 0 to 15 and a score below 5 points is within the normal range, from 5 to 9 indicates mild depression, and a score above 10 indicates moderate to severe depression. An answer of "Yes" on questions 2, 3, 4, 6, 8, 9, 10, 12, 14, and 15 or a "No" response to questions 1, 5, 7, 11, and 13 are indicative of depressive symptoms in an older adult.¹¹ The test was carried out by

Table 1. Kuder Richardson 20. Item Analysis.

Item	Corrected item-total correlation	Kuder Richardson if item deleted
1. Are you basically satisfied with your life?	0.300	0.721
2. Have you dropped many of your activities and interests?	0.173	0.731
3. Do you feel that your life is empty?	0.232	0.726
4. Do you often get bored?	0.567	0.688
5. Are you in good spirits most of the time?	0.499	0.696
6. Are you afraid that something bad is going to happen to you?	0.325	0.717
7. Do you feel happy most of the time?	0.474	0.699
8. Do you often feel helpless?	0.330	0.716
9. Do you prefer to stay at home, rather than going out and doing new things?	0.291	0.721
10. Do you feel you have more problems with memory than most?	0.235	0.727
11. Do you think it is wonderful to be alive now?	0.287	0.721
12. Do you feel pretty worthless the way you are now?	0.211	0.730
13. Do you feel full of energy?	0.086	0.739
14. Do you feel that your situation is hopeless?	0.531	0.692
15. Do you think that most people are better off than you are?	0.415	0.706

students from the last year of the career of Medicine with training for the adequate application of the scale and with the supervision of a qualified psychiatrist.

Statistical Analysis

Kuder-Richardson 20 coefficient is a measure of reliability for a test with binary variables which is the case of GDS (yes or not). The scores for this indicator range from 0 to 1, where 0 is no reliability and 1 is perfect reliability. The closer the score is to 1, the more reliable the test and its values above 0.5 show reasonable convergence of the items. Item correlation less than 0.30 was considered weak with poor clinical applicability; between 0.30 and 0.50 was considered moderate; and greater than 0.50 was considered strong. Both indicators were used to assess internal consistency of the items of the scales.

To assess hypotheses about the latent construct of the scale, we conducted a confirmatory factor analysis (CFA). Principal Components was used as the extraction method with a varimax rotation. Kaiser-Meyer-Olkin (KMO) index and Bartlett's sphericity test (BTS) were calculated to verify the adequacy of the sample size. The usual values for the KMO test are between 0.5 and 1 and P value less than .5 for the BTS.

The following indexes were analyzed to verify the model's goodness of fit Chi-square test (χ^2), with significance greater than 0.05; Root Mean Square Error of Approximation (RMSEA) was calculated, values equal to or lower than 0.08 are considered acceptable values. We selected those items with coefficients greater than 0.3 and with eigenvalues greater than 1.25. In all analyses, P value $<.05$ was considered to indicate statistical significance. SPSS version 24.0.

Results

Participants aged from 65 to 95 years (mean = 77.8, SD = 8.2). Percentage of men in the study was 53.6% (113). GDS mean score was 6.11 and SD 3.1. The percentage of subjects with depression was of 55.0%.

Internal Consistency

Items of the Yesavage Scale are presented in Table 1. Total Kuder Richardson was of 0.73, this indicator reveals good internal consistency of the items. The Corrected Item-Total Correlation was low (<0.3) for 7 items of the scale. From 0.30 and 0.50 we had 6 items (moderate) and 2 items had strong correlations (more than 0.50).

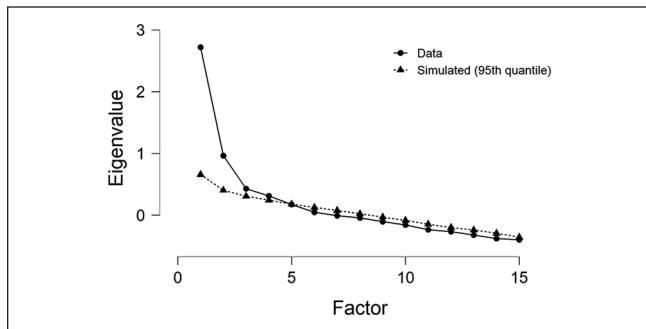
Confirmatory Factor Analysis

Factor analyses are used to identify groups of items that share a common underlying dimension. KMO for the whole scale, measure of sampling adequacy for the factor analysis was 0.74 within the established limits. Bartlett's Test of Sphericity reported a significant Chi-square value of with $P = .00$. RMSEA = 0.05 (CI95% 0.029-0.07). CFA was performed upon 15 items and showed that almost all items were distinctively and significantly loaded into respective 3 factors, explaining a cumulative variance of 43.6% (Table 2). An eigenvalue is an estimate of variance explained by a specific factor, and a value of more than 1 indicates an above-average amount of variance. We chose those eigenvalues above 1.25 (Figure 1).

The factor loadings ranged from 0.40 to 0.72. The first factor is composed of 6 items: "Have you dropped many of

Table 2. Component Characteristics.

Component	Eigenvalue	Proportion variance	Cumulative variance
PC1	3.408	0.227	0.227
PC2	1.852	0.123	0.351
PC3	1.278	0.085	0.436

**Figure 1.** Screeplot.

your activities and interests?,” “Do you often get bored?,” “Are you in good spirits most of the time?,” “Are you afraid that something bad is going to happen to you?,” “Do you feel happy most of the time?,” “Do you feel that your situation is hopeless?” that contribute to 22.7% of the total of variance. This factor is called “satisfaction.”

The second factor is also composed of 6 items: “Are you basically satisfied with your life?,” “Do you feel that your life is empty?,” “Do you often feel helpless?,” “Do you feel pretty worthless the way you are now?,” “Do you feel full of energy?,” and “Do you think that most people are better off than you are?.” This contribute to 12.3% of the total of variance. This factor is called “sad and hopeless mood.”

The third factor is composed of 3 items Do you prefer to stay at home rather than going out and doing new things?, “Do you feel you have more problems with memory than most?” and “Do you think it is wonderful to be alive now?.” This contribute to 8.5% of the total of variance. This factor is called “social disfunction” (Table 3).

Discussion

This is a study about the validation of the Spanish version of the Geriatric Depression Scale (GDS-15) in Ecuadorian subjects with more than 65 years old and it demonstrated that this scale could be used as a reliable screening tool for depression in elderly in the country. To the best of our knowledge, this is the first study to validate this scale in Ecuador.

Diagnosing depressive disorder in this group of age is of high importance, so in this respect, availability of a validated instrument used in local settings is needed. GDS-15 has 10 of the 15 items (Items 2-4, 6, 8-10,12, 14, and 15) indicating the presence of depression when answered positively, while the

other 5 items (Items 1, 5, 7, 11, and 13) indicate depression when answered negatively. In the current study, more than a half of the patients were depressed with 5 or more points of GDS-15 scale. Similar results were reported by authors from Greece.¹¹

In a meta-analysis, it was reported that across all studies, the prevalence of late-life depression was 29.2% (95% confidence interval of 24.7%-33.9%), with no difference between inpatients, outpatients, and nursing homes.¹²

According to The Global Burden of Disease Study 2017¹³ depression ranked as the third most leading cause of the years of life lost to disability. Prevalence of depression in this kind of subjects could range from 4.5% to 50% according some authors,¹⁴⁻¹⁷ which is consistent with what was found in study.

Mean of this scale in the sample of subjects in the current study was above 6, indicating a mild depression. Mild depression has been reported by some authors showing a mean score very similar to our results.^{18,19} Other authors have reported less than 5 points.^{20,21}

The root mean square error of approximation in the GDS-15 was of 0.05. Results of 0.077 in this indicator was reported by Chinese researchers.²²

Our results showed that the GDS-15 has a high internal consistency with a KR20 coefficient value of 0.73. Factors extracted using exploratory factor analysis accounted for 45.6% of the variance and the item loadings were between 0.40 to 0.72. Higher values were reported in a study performed in China.²³

In a previous validation of this questionnaire in its Spanish version, it was reported a Cronbach alpha coefficient was 0.82.²⁴ Other authors also reported high values of Cronbach while evaluating this scale.^{8,25,26} It is of our consideration due to the dichotomic nature of questions of this instrument that KR20 is a better approach to assess the internal consistency of GDS-15.

The parameters of validity for the Spanish adapted version of the questionnaire were acceptable and similar to those of the original version,⁹ nevertheless our results are different.

The GDS-15 factorial analysis showed a structure with 3 factors also different from the structure of the original version developed by Sheik et al.²⁷ This version had 30 questions composed of 5 factors: sad mood (questions 6, 8, 10, 13, 16,18, 22, 23, 25), lack of energy (questions 2, 20, 21, 26, 29, 30), positive mood (questions 5, 7, 9, 15, 19, 27), agitation (questions, 4,11, 24), and social withdrawal (questions 12, 28). According these authors the GDS explore affective and motivational cognitive components of depression and examine the neuro-vegetative

Table 3. Loading Factors in Confirmatory Factor Analysis (CFA) (Rotated).

Item	Factor 1	Factor 2	Factor 3
5. Are you in good spirits most of the time?	0.769	0.099	0.029
7. Do you feel happy most of the time?	0.761	-0.015	0.169
4. Do you often get bored?	0.738	0.212	0.068
14. Do you feel that your situation is hopeless?	0.621	0.094	0.386
2. Have you dropped many of your activities and interests?	0.487	-0.289	0.030
6. Are you afraid that something bad is going to happen to you?	0.404	0.219	0.014
3. Do you feel that your life is empty?	0.142	0.688	-0.249
13. Do you feel full of energy?	-0.140	0.537	-0.052
1. Are you basically satisfied with your life?	0.146	0.518	0.076
8. Do you often feel helpless?	0.294	0.511	-0.002
12. Do you feel pretty worthless the way you are now?	-0.057	0.463	0.280
15. Do you think that most people are better off than you are?	0.278	0.436	0.292
10. Do you feel you have more problems with memory than most?	0.111	-0.066	0.715
11. Do you think it is wonderful to be alive now?	-0.093	0.447	0.592
9. Do you prefer to stay at home rather than going out and doing new things?	0.292	-0.082	0.567

and somatic components. It excludes symptoms such as disturbance in sleep, appetite, and weight.²⁷

For example, for Malakouti et al,²⁸ 24 2006 the scale showed a 2 factors structure, the first factor included 11 items of the GDS, and the second factor included 3 items. Also, for these authors the scale has 2 factors structure.²⁵

The 3 factors we identified in this study were a first factor including questions 5, 7, 4, 14, 2, and 6, the second factor with questions 3, 13, 1, 8, 12, and 15 and the third factor comprised the questions 14, 15, and 12. Many authors have validated this scale nevertheless the factor loadings have been different from what we are reporting in this study. Other authors have found GDS-15 with 3 factors structure like our results.¹⁹

Factor Analysis of the GDS-15 reported by Fountoulakis et al²⁹ revealed 4 factors: a cognitive (thought content), an affective, a functional, and a factor that reflects helplessness and fear for the future.

A meta-analysis performed in 2013 reported that most of the studies applying factor analysis to investigate the original English version of the GDS-15 extracted between 2 and 4 factors.³⁰

Due to the different results across different countries, to our consideration this scale should not be used as the unique way of screening for depression in geriatric patients.

Despite great efforts to develop GDS-15 in different cultures, depression for older adults may vary greatly across different regions.

Limitations

The design of the study is cross-sectional. No concurrent criterion validity was assessed. Most of our subjects were male limiting the generalizability of the findings. GDS-15 was self-administered. We also have worked with a modest sample size. Other limitation was that the study group consisted of patients of a single health institution.

Conclusion

GDS-15 in its Spanish version could be used for screening of depression in elderly Ecuadorian older adults. More studies on aspects of validity of this scale should be performed to have a better criterion. It should be combined with tools for confirm the depression diagnosis in this population.

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Declaration of Conflicting Interests

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

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Research Ethics and Patient Consent

Subjects after receiving appropriate information about the aims and duration of the study they gave written informed consent. They were also informed that participation was voluntary, and that the collected information was anonymous. This study was approved by Ethics Committee of the National Institute of Public Health. We followed Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for the report of this study.

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Data Availability

The raw data that support the findings of this study are available from the corresponding author upon reasonable request.

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