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Accuracy of the 15-item Geriatric Depression Scale (GDS-15) in a community-dwelling oldest-old sample: the Pietà Study

Acurácia da versão de 15 itens da Escala de Depressão Geriátrica (GDS-15) em uma amostra de idosos muito-idosos residentes na comunidade: Estudo Pietà

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Abstract

Introduction: Late-life depression (LLD) is common, but remains underdiagnosed. Validated screening tools for use with the oldest-old in clinical practice are still lacking, particularly in developing countries.

Objectives: To evaluate the accuracy of a screening tool for LLD in a community-dwelling oldest-old sample.

Methods: We evaluated 457 community-dwelling elderly subjects, aged ≥ 75 years and without dementia, with the Geriatric Depression Scale (GDS-15). Depression diagnosis was established according to DSM-IV criteria following a structured psychiatric interview with the Mini International Neuropsychiatric Interview (MINI).

Results: Fifty-two individuals (11.4%) were diagnosed with major depression. The area under the receiver operating characteristic (ROC) curve was 0.908 ($p < 0.001$). Using a cut-off score of 5/6 (not depressed/depressed), 84 (18.4%) subjects were considered depressed by the GDS-15 (kappa coefficient = 53.8%, $p < 0.001$). The 4/5 cut-off point achieved the best combination of sensitivity (86.5%) and specificity (82.7%) (Youden's index = 0.692), with robust negative (0.9802) and reasonable positive predictive values (0.3819).

Conclusion: GDS-15 showed good accuracy as a screening tool for major depression in this community-based sample of low-educated oldest-old individuals. Our findings support the use of the 4/5 cut-off score, which showed the best diagnostic capacity.

Keywords: Depression, geriatric psychiatry, geriatric assessment.

Resumo

Introdução: A depressão geriátrica (DG) é um transtorno prevalente que permanece sendo subdiagnosticado. Ferramentas validadas para rastreio de DG em idosos muito idosos na prática clínica são necessárias, especialmente em países em desenvolvimento.

Objetivos: Avaliar a acurácia diagnóstica da Escala de Depressão Geriátrica (Geriatric Depression Scale, GDS-15) em uma população de idosos muito idosos residentes na comunidade.

Métodos: Foram avaliados, com a GDS-15, 457 indivíduos não-demençados, residentes na comunidade, com idade ≥ 75 anos. O diagnóstico definitivo de depressão maior foi realizado através da entrevista semiestruturada Mini International Neuropsychiatric Interview (MINI), de acordo com os critérios do DSM-IV.

Resultados: Cinquenta e dois indivíduos (11,4%) foram diagnosticados com episódio depressivo maior. A área sob a curva *receiver operating characteristic* (ROC) foi de 0,908 ($p < 0,001$). Utilizando-se o ponto de corte 5/6 (não-deprimido/deprimido), 84 (18,4%) indivíduos foram considerados deprimidos pela GDS-15 (coeficiente de kappa = 53,8%, $p < 0,001$). O ponto de corte 4/5 atingiu a melhor combinação entre sensibilidade (86,5%) e especificidade (82,7%) (índice de Youden = 0,692), com valor preditivo negativo robusto (0,9802) e razoável valor preditivo positivo (0,3819).

Conclusão: A GDS-15 demonstrou boa acurácia para o rastreio de depressão maior nesta amostra de base populacional de idosos muito idosos com baixa escolaridade. Os resultados do presente estudo indicam que o ponto de corte 4/5 mostrou-se mais adequado para utilização nesta população.

Descritores: Depressão, psiquiatria geriátrica, avaliação geriátrica.

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Introduction

In the last decades, the world has been going through important demographic changes with a growing elderly population.¹ This phenomenon, which is even more substantial in developing countries, creates a crowd of oldest-old people prone to develop neuropsychiatric disorders.

Late-life depression (LLD) is the most common psychiatric disorder in the elderly. Prevalence rates differ depending on study setting, population, diagnostic instrument and age range. A systematic review found prevalence rates of LLD for individuals aged 75 years and over between 4.6% and 9.3%.² LLD has been associated with increased morbidity, use of health services and mortality rates,³ making this disorder an important public health issue.

Despite its pivotal public health relevance, LLD remains largely underdiagnosed and undertreated. Hence, it is of utmost importance that elderly individuals be actively screened for LLD. In order to do that, an instrument specifically validated for use in the oldest-old population is necessary.

The 15-item version of the Geriatric Depression Scale (GDS-15)⁴ is a time-constrained interviewer-administered scale with good psychometric properties and wide acceptance in the scientific community. It has been translated and validated for the Brazilian elderly population,⁵ but to date, no study has been conducted specifically with individuals aged 75+ years.

The objective of this study was to evaluate the accuracy of the GDS-15 for diagnosing LLD in a community-dwelling oldest-old sample.

Methods

Study design and targeted population

This cross-sectional analysis is part of the Pietà Study, an epidemiological investigation on brain aging, conducted in Caeté, state of Minas Gerais, Brazil.⁶ In 2007, a year before data collection, 1,251 individuals aged 75+ years were living in the city and were invited to participate in the study. Community agents from the family health program and municipal health department were contacted, and announcements were aired on local radio stations and printed in newspapers. The research team visited the two existing institutions in Caeté to identify eligible institutionalized elderly individuals. A total of 639 individuals (51.1% of the target population within this age group) agreed to participate in the study and were subjected to a comprehensive medical, neurological and psychiatric evaluation.

Instruments

All 639 individuals were interviewed by either a board-certified psychiatrist, neurologist or geriatrician, with at least 3 years of experience in neurological and psychiatric evaluation of elderly individuals, using the GDS-15^{4,5} and the Mini International Neuropsychiatric Interview (MINI).⁷ Major depression was diagnosed based on criteria from the Diagnostic and Statistical Manual of Mental Disorders, 4th edition (DSM-IV), according to MINI results. In order to establish the diagnosis of dementia, individuals went through a cognitive evaluation comprising the Mini-Mental State Examination (MMSE),⁸ Brief Cognitive Battery (BCB),⁹⁻¹¹ Functional Assessment Staging¹² and Pfeffer's Functional Activities Questionnaire (FAQ).¹³

Exclusion criteria

Subjects who refused or could not sign the informed consent form and had no legally accepted representatives were not included. Also, individuals with severe sensory impairment that precluded appropriate understanding of the questionnaires were excluded. We further excluded individuals who were diagnosed as having dementia according to DSM-IV criteria, after adjudication of cognitive status.

Ethical considerations

The study was approved by the ethics committee of Universidade Federal de Minas Gerais, and all participants or their legally acceptable representatives signed the written informed consent form.

Statistical analysis

All statistical analyses were conducted using the Statistical Package for the Social Sciences (SPSS) version 20. Kappa coefficient was calculated to evaluate the level of agreement between GDS-15 and MINI results. A receiver operating characteristic (ROC) curve was used to calculate sensitivity and specificity for different GDS-15 cut-off scores. *p*-values <0.05 were considered as statistically significant.

Results

Of 639 individuals, 174 were diagnosed as having dementia, and 8 subjects had missing data and were thus excluded from the analysis. Within the final sample (*n*=457), 52 subjects (11.4%) were diagnosed by the MINI as having major depression; of these, 77.8% were female, with 80.7±4.6 years of age and 3.9±3.4 years of schooling.

Using the previously established cut-off score of 5/6 (not depressed/depressed),⁵ 84 (18.4%) subjects

(69.1% female, 81.1 ± 4.9 years of age and 3.6 ± 3.1 years of schooling) were considered depressed by the GDS-15. The kappa agreement coefficient between GDS-15 and MINI was 53.8% ($p < 0.001$) – low, but statistically significant. This finding is expected if we take into account that both a screening tool and a gold-standard instrument were used.

The area under the ROC curve was 0.908 ($p < 0.001$), which denotes very good diagnostic accuracy of the GDS-15 for individuals aged ≥ 75 years. Using Youden's index, the 4/5 cut-off score achieved the best combination of sensitivity and specificity (86.5 and 82.7%, respectively; Youden's index = 0.692) and presented a negative predictive value as strong as the lower cut-off points (0.9802), with a more powerful positive predictive value (0.3819) (Table 1).

Discussion

Our findings reinforce the use of the GDS-15 as a suitable instrument for screening depression in this low-educated Brazilian population of oldest-old individuals, and suggest a lower cut-off score as more appropriate.

The cut-off score that had the best performance in our study is different from that proposed (5/6) in the scale validation study conducted in Brazil⁵ and from other cut-offs already used.¹⁴ It is possible that this divergence stems from the very low levels of schooling and higher mean age of the population studied in the

present investigation, compared to the aforementioned studies. Conversely, our findings are in agreement with those reported by Marc et al., who proposed the 4/5 cut-off score when studying an elderly homebound population.¹⁵ Hence, for low-educated individuals in latest life, a lower threshold for a positive screening in the GDS-15 seems more appropriate.

Considering the low level of agreement with the semi-structured psychiatric interview in our study, the GDS-15 should be used only for screening purposes, or, when applied in prevalence studies, should imply a diagnosis of clinically significant depressive symptoms¹⁶ rather than of major depressive episode as seen in some studies.²

Even though the studied sample was representative of the oldest-old city population, one of the limitations of our work resides on the relatively low response rate to participate in the study. Conversely, the main strength is that diagnosis of LLD was made via semi-structured interviews performed by experienced physicians. Furthermore, dementia diagnosis, as an exclusion criterion, was established after the performance of comprehensive cognitive and functional evaluations and discussions among study clinicians/researchers until consensus was reached.

In conclusion, the GDS-15 showed good accuracy as a screening tool for major depression in oldest-old low-educated Brazilian individuals. The 4/5 cut-off score showed the best performance, balancing the test's sensitivity and specificity, with good negative and positive predictive values.

Table 1 - Diagnostic properties for different cut-off points of the 15-item Geriatric Depression Scale

Not depressed/Depressed	Sensitivity	Specificity	Youden's index*	PPV†	NPV†
1/2	0.981	0.348	0.329	0.1568	0.9932
2/3	0.942	0.568	0.51	0.2122	0.9875
3/4	0.942	0.733	0.675	0.3036	0.9903
4/5	0.865	0.827	0.692	0.3819	0.9802
5/6	0.788	0.894	0.682	0.4788	0.9715
6/7	0.692	0.919	0.611	0.5135	0.9602
7/8	0.538	0.948	0.486	0.5611	0.9431
8/9	0.442	0.968	0.41	0.6306	0.9334
9/10	0.288	0.98	0.268	0.6402	0.9176
10/11	0.192	0.995	0.187	0.8259	0.9087
11/12	0.154	0.998	0.152	0.9049	0.9051
12/13	0.115	1	0.115	1	0.90
13/14	0.096	1	0.096	1	0.8994
14/15	0.038	1	0.038	1	0.8937

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

* Youden's index = sensitivity + specificity - 1.

† Statistics calculated considering a mean prevalence of 11% in the study population.

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Disclosure

No conflicts of interest declared concerning the publication of this article.

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