

Factors associated with depressive symptoms measured by the 12-item General Health Questionnaire in Community-Dwelling Older Adults (The Bambuí Health Aging Study)

Fatores associados aos sintomas depressivos avaliados pelo General Health Questionnaire (12 itens) em idosos residentes na comunidade (Projeto Bambuí)

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Abstract

Objective: To investigate factors associated with depressive symptoms in community-dwelling older adults. **Method:** This study evaluated 1,510 participants of the Bambuí Health Aging Study baseline. The dependent variable was the presence of depressive symptoms assessed by the 12-item General Health Questionnaire and predictive variables were sociodemographic characteristics, social support network, lifestyle and health conditions. **Results:** The prevalence of depressive symptoms was 38.5% (12-item General Health Questionnaire ≥ 5). Depressive symptoms were positively and independently associated with female gender (PR = 1.15; 95%CI 1.01-1.33), aged 80 years or over (PR = 1.22; 95%CI: 1.02-1.54) compared with 60-69 years, single (PR = 1.25; 95%CI: 1.02-1.46) or separated (PR = 1.30; 95%CI: 1.03-1.65) marital status, less than 4 years of schooling (PR = 1.42; 95%CI: 1.04-2.00), self-reported global health (reasonable: PR = 1.84; 95%CI 1.45-2.34; bad or very bad: PR = 2.44; 95%CI 1.91-3.12), incapacity or great difficulty in performing daily activities (PR = 1.39; 95%CI: 1.22-1.57) and complaint of insomnia in the last month (PR = 1.77; 95%CI: 1.22-1.99). **Conclusion:** The similarities between factors associated with depressive symptoms in this population and in others do not explain the high prevalence rates previously reported in Bambuí. These findings may guide efforts to investigate others factors to elucidate the etiopathogenesis of depression in this population.

Descriptors: Depression; Aged; Precipitating factors; Comparative study; Epidemiologic measurements

Resumo

Objetivo: Investigar os fatores associados aos sintomas depressivos em idosos residentes na comunidade. **Método:** Este estudo seccional foi desenvolvido em 1.510 idosos, que correspondem a 86% do total de residentes na cidade de Bambuí-MG com 60 ou mais anos de idade. A variável dependente deste estudo é a presença de sintomas depressivos, determinada por meio do General Health Questionnaire (12 itens). As variáveis independentes incluíram características sociodemográficas, indicadores da rede social de apoio, estilos de vida e indicadores das condições de saúde. **Resultados:** A prevalência de sintomas depressivos foi de 38,5% (score no General Health Questionnaire ≥ 5). Associações positivas e independentes com esses sintomas foram observadas para sexo feminino (RP = 1,15; IC95%: 1,01-1,33), faixa etária de 80 anos ou mais (RP = 1,22; IC95%: 1,02-1,54) comparada com idades entre 60 e 69 anos, ser solteiro (RP = 1,25; IC95%: 1,02-1,46) e ser separado (RP = 1,30; IC95%: 1,03-1,65), anos de escolaridade inferior a quatro anos (RP = 1,42; IC95%: 1,04-2,00), percepção da saúde como razoável (RP = 1,84; IC95%: 1,45-2,34) e ruim ou muito ruim (RP = 2,44; IC95%: 1,91-3,12), incapacidade funcional (RP = 1,39; IC95%: 1,22-1,57) e insônia nos últimos 30 dias (RP = 1,77; IC95%: 1,22-1,57). **Conclusão:** Os fatores associados aos sintomas depressivos são semelhantes aos descritos em outros estudos e não explicam a alta prevalência de depressão encontrada em Bambuí. Esses achados demonstram a necessidade de investigação de outros fatores na tentativa de elucidar a etiopatogenia da depressão nessa população.

Descritores: Depressão; Idosos; Fatores desencadeantes; Estudo comparativo; Medidas em epidemiologia

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Introduction

Evidence suggests that depression is the most prevalent¹ and relevant^{2,3} psychiatric condition present in late-life. There are wide variations in reported prevalences (0.4 to 35%). However, methodological differences between studies, particularly regarding sampling, definition and assessment of outcome preclude firm conclusions about cross-cultural and geographical differences.⁴

In the general population, where the great majority will not show any signs of psychopathology, clinical diagnostic interviews are often too expensive and time-consuming to justify their use for the purposes of mental health assessment in epidemiological research. This is particularly the case in contexts where mental health is not the primary focus of research. In such situations, a lay administered screening scale may be more effective.⁵

The General Health Questionnaire (GHQ)⁶ is probably the most widely used screening scale for mental disorders. It was selected by the World Health Organization (WHO) as the screening scale in a large multicentre primary care study because of its high sensitivity and specificity in various settings and cultures.⁶ The shorter 12-item version has been shown to be equally effective as the longer 28-item version in screening for common mental disorders.⁷ A previous study that simultaneously used the GHQ-12 and the GDS-30,⁸ a screening scale which was specially designed to evaluate elderly people, demonstrated that the GDS-30 did not perform better than the GHQ-12 and also was biased in similar ways.⁹ Tentatively, it was suggested that the GHQ-12 might be preferred, particularly where assessment of psychological morbidity across a wide age range, from younger to older adults, is required.⁹

Several studies have demonstrated that depression among the elderly is associated with many factors. A recent meta-analysis showed that among elderly community subjects bereavement, sleep disturbance, disability, prior depression and female gender appear to be the most important risk factors for current depression.¹⁰ To the best of our knowledge, there is only one Brazilian study about factors associated with depression in older adults, which was conducted in a probability sample of 583 elderly residents of the city of Pelotas-RS.¹¹ However, this study has the limitation of applying a non-standardized instrument created by the authors using eight depressive symptoms commonly present in questionnaires and depression scales administered to the elderly.¹¹

The aim of the present study was 1) to determine the factors associated with depressive symptoms in the baseline of the Bambuí Health Aging Study (BHAS) using the GHQ-12, and 2) to compare the findings with studies that applied scales specifically developed for the assessment of depression in older adults.

Method

This study was accomplished at the baseline of the BHAS, which is a population-based study on health and aging. Bambuí is a city of 15,000 inhabitants in the state of Minas Gerais,¹² where agriculture, dairy production and commerce are the main economic activities. The city has a general hospital (62 beds), one physician for every thousand inhabitants and no psychiatrist. Human development rate is 0.70 and life expectancy at birth is 70.2 years. The baseline was composed of 1606 individuals, corresponding to 92.2% of all Bambuí residents aged 60 years or older, identified by a census. Characteristics of participants were similar to those of the total population in the same age group regarding gender, number of persons in the home, marital status, family income and schooling. For the present study, all participants from the baseline who answered the GHQ-12 were selected (n = 1,510). Informed

consent was obtained and the Ethical Committee of the Oswaldo Cruz Foundation approved the project.

Variables

1. Dependent variable

The dependent variable of this study was the presence of depressive symptoms measured by the GHQ-12. It detects non-psychotic mental disorders and has been well studied in many settings and cultures,⁶ including Brazil.¹³ Recently, it was also validated for detecting depressive symptoms in the older population.^{9,14} Cut-off point ≥ 5 presented the best trade-off between sensitivity and specificity for the detection of depressive symptoms in the elderly population of Bambuí.⁹

2. Independent variables

The independent variables of this study included socio-demographic characteristics, indicators of social support network, lifestyle, and health conditions. The socio-demographic variables were gender, age group, marital status and number of complete years of schooling. As indicators of social support network, living with offspring, frequency of visits from offspring, relatives and neighbours in the last month were considered.

Lifestyle considerations included frequency of 20 to 30 minutes of physical exercise in the last 90 days, present consumption of cigarettes among those who had already smoked at least 100 cigarettes during their lifetime and episodes of excessive consumption of alcohol (5 or more drinks on a single occasion) in the last 30 days. Further information can be found in previous publications.^{15,16}

Health condition indicators used in this study were: self-evaluation (determined by the question: "In general, how would you say your health is?"), impairment or great difficulty to perform at least one among five daily activities (dressing, eating, walking around inside the house, bathing and using the toilet), complaint of insomnia in the last 30 days,¹⁷ diabetes mellitus (fasting glycemia ≥ 126 mg/dL or present use of a hypoglycemic agent),¹⁸ high blood pressure (average of two among three measurements of blood pressure ≥ 140 and/or ≥ 90 mmHg or current,¹⁹ body mass index (BMI = kg/m²) and waist circumference.²⁰

The interview was administered by lay interviewers who were selected from the community. They had at least 11 years of schooling and were intensely trained by a psychiatrist (Uchôa E.) for the standardized application of the interviews.

Statistical analysis

In cross-sectional studies, two measures of effect are more commonly used: the prevalence odds ratio (POR) and the prevalence ratio (PR).^{21,22} The choice between them has been a source of an ongoing debate in the epidemiological literature over the past few years.²¹⁻²⁶ There is no dispute that both will be similar when the event is a rare disease, but they may be very discrepant for common diseases, which are often the focus of cross-sectional studies.^{22,23}

The use of adjusted odds ratio to estimate adjusted relative risk is appropriate in studies of rare outcomes. However it may be misleading when the outcome is common and in this case the PR should be preferred.²¹⁻²³ PR prevents the overestimation of the magnitude of association with a better control of confounders than the odds ratio (OR).^{21,23} PR is difficult to estimate in multivariate settings. The simplest way is to transform the odds ratio obtained by logistic regression into PR.²⁷ Alternatives explored in the epidemiological literature are Cox regression,²⁸ log-binomial regression,²⁷ Poisson

Table 1 - Result of the analysis of the association between (the presence of) depressive symptoms (GHQ-12 \geq 5) and socio-demographic characteristics, among elderly participants of the baseline of the Bambui Health Aging Study

Variables	Depressive symptoms		PR (95% CI)	
	Yes	No	Non-adjusted	Adjusted for age and gender
Gender				
Male	178 (30.3)	410 (69.7)	1.00	1.00
Female	404 (43.8)	518 (56.2)	1.45 (1.25-1.67)**	1.44 (1.25-1.66)**¹
Age group (years)*				
60-69	338 (37.4)	565 (62.6)	1.00	1.00
70-79	169 (37.2)	285 (62.8)	0.99 (0.96-1.15)	0.99 (0.86-1.14) ²
80 +	75 (49.0)	78 (51.0)	1.31 (1.09-1.57)**	1.44 (1.25-1.67)**²
Marital status*				
Married or living together	247 (33.1)	500 (66.9)	1.00	1.00
Single	60 (40.8)	87 (59.2)	1.23 (0.99-1.54)	1.11 (0.89-1.38)
Separated	39 (49.4)	40 (50.6)	1.49 (1.17-1.91)**	1.42 (1.11-1.82)**
Widowed	236 (44.0)	301 (56.0)	1.33 (1.16-1.53)**	1.11 (0.95-1.30)
Years of schooling*				
8+	27 (21.8)	97 (78.2)	1.00	1.00
4-7	148 (35.4)	270 (64.6)	1.17 (1.02-1.36)	1.14 (0.98-1.31)
0-3	407 (42.0)	561 (58.0)	1.92 (1.36-2.70)**	1.92 (1.33-2.63)**

GHQ: General Health Questionnaire, PR (95% CI): Prevalence rate estimated by Robust Poisson Regression¹; adjusted by age²; adjusted by gender, * $p < 0.20$; ** $p < 0.05$

regression with robust estimates²⁶ and complementary log-log model.²⁹ In the present study, statistical analysis was based on crude and adjusted PR estimated by Robust Poisson Regression, which provides correct estimates of standard errors.^{26,30} The mathematical computations for PR are identical to the relative risk in cross-sectional studies.²²

Gender and age group were considered *a priori* confounding variables and were included in all multivariate models. The initial multivariate model also included all variables associated with depressive symptoms in the univariate analysis, at a level of 0.20 or less. In the final model, only variables that maintained an association with these symptoms at a level of 0.05 or less were retained. A maximum-likelihood approach was used to establish the most parsimonious predictive model from the logistic regression. In this approach, each reduced hypothesis was tested against the general model (gender, age, marital status, schooling, physical exercise, alcohol consumption, self-reported health,

impairment in daily activities, insomnia, waist circumference) using a likelihood ratio test. The most parsimonious model represents the combination of all non-rejected hypotheses and is desirable because it uses fewer parameters. The statistical analyses were performed using STATA software, version 9.1.

Results

Among the 1,742 elderly residents of the study area, 86.7% answered the GHQ-12 (94 refused or had an incomplete GHQ-12). Women (61.1%), younger elderly (59.8% were less than 70 years old) and those with low schooling levels (64.1% had never gone to school or had 4 or less years of schooling) comprised the largest groups. 38.5% of the participants presented depressive symptoms (GHQ-12 score \geq 5).

In Table 1, the univariate and the multivariate analyses,

Table 2 - Results of the analysis of the association between depressive symptoms (GHQ-12 \geq 5) and indicators of social support network and lifestyle among elderly participants of the baseline of the Bambui Health Aging Study

Variables	Depressive symptoms		PR (95% CI)	
	Yes	No	Non-adjusted	Adjusted by age and gender
Living with offspring				
No	290 (41.0)	418 (59.0)	1.00	1.00
Yes	292 (36.4)	510 (63.6)	0.89 (0.78-1.01)*	0.88 (0.78-1.00)*
Frequency of visits in the last month from offspring, relatives and friends				
\geq once a week	240(39.0)	376(61.0)	1.00	1.00
< once a week	108(40.0)	162(60)	1.03 (0.81-1.31)*	1.02 (0.80-1.31)*
Frequency in the last 90 days of exercise lasting 20 to 30 minutes during leisure time*				
\geq 3 times a week	53 (26.5)	147 (73.5)	1.00	1.00
< 3 times a week	43 (35.3)	79 (64.7)	1.33 (0.95-1.86)*	1.19 (0.86-1.67)*
Never	486 (40.9)	702 (59.1)	1.54 (1.21-1.96)**	1.45 (1.14-1.84)**
Present smoking				
No	480 (38.9)	754 (61.1)	1.00	1.00
Yes	102 (37.0)	174 (63.0)	0.95 (0.80-1.13)	1.02 (0.92-1.31)
Period of excessive alcohol consumption (\geq 5 drinks) in the last 30 days				
No	556 (39.1)	866 (60.9)	1.00	1.00
Yes	26 (29.6)	62 (70.4)	0.76 (0.54-1.05)*	0.97 (0.69-1.36)*

GHQ: General Health Questionnaire
PR (95%CI): Prevalence rates estimated by Robust Poisson Regression
* $p < 0.20$; ** $p < 0.05$

adjusted by gender and age, for the association between depressive symptoms and sociodemographic characteristics are presented. Female gender, 80 or more years of age, separated marital status and less than 4 years of schooling were associated with depressive symptoms in the adjusted analysis.

Regarding the association of depressive symptoms with social support network, health conditions and lifestyle, only the absence of physical exercise during leisure time, perception of global health as reasonable or bad/very bad, impairment or difficulty in performing activities of daily life and insomnia were still associated with depressive symptoms after adjusting for gender and age (Table 2 and Table 3).

In Table 4, we display the results of the multivariate analysis simultaneously adjusted for all factors associated with depressive symptoms in the previous models. In this final model, female gender, age 80 years or over, single or separated marital status, less than 4 years of schooling, reasonable or bad/very bad self-perception of global health, impairment in performing daily activities and insomnia remained independently associated with depressive symptoms measured by GHQ-12.

Discussion

The results of this study show that the depressive symptoms among the elderly measured by GHQ-12 was associated with female gender, the oldest age group, the lowest levels of schooling, worse health conditions, impairment in daily activities and insomnia. These results are consistent with the literature^{10,31} and confirm previous observations in this population, where depressive symptoms were associated with worse health conditions among the older adult participants of Bambuí.^{32,33}

A recent meta-analysis reported that 25 risk factors for depression were considered in studies using only univariate analysis while 15

factors were considered in studies using multivariate analysis.¹⁰ According to authors, all studies that used screening scales and multivariate analysis found that disability (4 studies), new medical illness (2) and sleep disturbances (2), poor self-perceived health (2 studies) and poor social support (1) were associated with depression. Poor health status and female gender were associated with depression in half of these studies whereas no association was reported with unmarried marital status and lower education.¹⁰

POR and PR have both been used as estimators of effect in cross-sectional studies.²¹ However, there are many evidences that the PR is more appropriate. It is more interpretable and more consistent for estimating the true effect. On the other hand, the POR is difficult to interpret as an effect measure (beyond specific settings) and can sometimes under- or overestimate the effect. Finally, the use of the POR will not necessarily lead to the same conclusions as that of the PR about effect modification or confounding.

As expected, comparing the PR used in the current study with the OR estimated in previous studies demonstrated an overestimation obtained from the OR.^{21,23} In studies which reported an association of depression with female gender the OR varied from 1.3 to 3.4,³¹ slightly higher than the value found in the final model of the current study (PR = 1.15). Association between aging and depression has been inconsistent^{10,31} and has tended to disappear after adjustment for functional disability, comorbid medical disorders and social deprivation.³⁴ In our study, despite controlling for functional disability, co-morbid medical disorders and schooling (a variable related to social deprivation), depression was still more prevalent in older participants. This may have occurred because a screening test was used to define the presence of depressive symptoms. In a previous study in Bambuí, which used the Schedules for Clinical Assessment in Neuropsychiatry (SCAN) for diagnostic definition, this association was not observed.³³

Table 3 - Results of the analysis of the association between depressive symptoms (GHQ-12 \geq 5) and indicators of health conditions among elderly participants of the baseline of the Bambuí Health Aging Study

Variables	Depressive symptoms		PR (95% CI)	
	Yes	No	Non-adjusted	Adjusted for age and gender
Self-reported global health*				
Good or very good	64 (17.2)	309 (82.8)	1.00	1.00
Reasonable	281 (37.8)	463 (62.2)	2.20 (1.73-2.80)**	2.13 (1.67-2.71)**
Bad or very bad	237 (60.3)	156 (39.7)	3.52 (2.77-4.46)**	3.32 (2.61-4.21)**
Impairment or great difficulty performing daily activities¹				
No	451 (34.4)	861 (65.6)	1.00	1.00
Yes	131 (66.8)	65 (33.2)	1.94 (1.72-2.20)**	1.88 (1.65-2.13)**
Insomnia in the last 30 days				
No	242 (26.2)	680 (73.8)	1.00	1.00
Yes	340 (57.8)	248 (42.2)	2.20 (1.94-2.51)**	2.13 (1.87-2.43)**
Diabetes mellitus				
No	461 (38.3)	744 (61.7)	1.00	1.00
Yes	79 (37.1)	134 (62.9)	0.97 (0.80-1.17)	0.96 (0.79-1.16)
High blood pressure				
No	203 (37.6)	337 (62.4)	1.00	1.00
Yes	337 (38.3)	542 (61.7)	1.02 (0.89-1.17)	0.98 (0.85-1.12)
Body mass index (Kg/m²)				
< 18.5	39 (40.6)	57 (59.4)	1.10 (0.85-1.43)	1.06 (0.82-1.37)
18.6-24.9	227 (36.9)	389 (63.2)	1.00	1.00
25.0-29.9	183 (36.7)	316 (63.3)	1.00 (0.85-1.16)	0.96 (0.83-1.25)
\geq 30	75 (40.8)	109 (59.2)	1.11 (0.90-1.35)	1.02 (0.83-1.25)
Waist circumference (> 102 cm for men and > 88 cm for women)				
No	261 (34.3)	501 (65.7)	1.00	1.00
Yes	310 (42.7)	416 (57.3)	1.25 (1.10-1.42)**	1.08 (0.94-1.25)*

GHQ: General Health Questionnaire, PR (95% CI): Prevalence rate estimated by Robust Poisson Regression, ¹ Dressing, eating, walking around the house, bathing, using the toilet, ² Fasting glycemia \geq 126 mg/dL or present treatment; ³ Blood pressure \geq 140 or 90 mmHg or present treatment; , * $p < 0.20$; ** $p < 0.05$

Table 4 - Final model of factors associated with depressive symptoms (GHQ-12 \geq 5) among elderly participants of the baseline of the Bambuí Health Aging Study

Variables	PR (95%CI)
Gender	
Male	1.00
Female	1.15 (1.01-1.33)*
Age group (years)	
60-69	1.00
70-79	1.01 (0.89-1.16)
80 +	1.22 (1.02-1.54)*
Marital status	
Married or living together	1.00
Single	1.25 (1.02-1.46)*
Separated	1.30 (1.03-1.65)*
Widowed	1.09 (0.95-1.25)
Years of schooling	
8+	1.00
4-7	0.99(0.86-1.13)
0-3	1.42 (1.04-2.00)*
Self-reported global health	
Good or very good	1.00
Reasonable	1.84 (1.45-2.34)**
Bad or very bad	2.44 (1.91-3.12)**
Impairment or great difficulty to perform daily activities[†]	
No	1.00
Yes	1.39 (1.22-1.57)**
Insomnia in the last 30 days	
No	1.00
Yes	1.77 (1.22-1.99)**

PR (CI95%): Prevalence rate (confidence interval, 95%) adjusted by the Robust Poisson Regression method for all the variables listed in the table. Beyond these, the initial multivariate model included living with offspring, frequency of visits with relatives, frequency of exercise, episodes of excessive consumption of alcohol, and waist circumference.

[†] Dressing, eating, walking around the house, bathing, using the toilet

* $p < 0.05$; ** $p < 0.01$

The association of marital status with depressive symptoms is also inconsistent among studies.^{10,31} In the meta-analysis mentioned before, this association was not observed, maybe due to methodological differences. In the present study marital status was measured as a categorical variable (married/living together, single, separated, widowed) instead of a dichotomic one (married/unmarried). Studies that demonstrated this association showed OR values from 1.1 to 1.9 for married, separated or divorced subjects,³¹ similar to the ones we obtained after adjustment for all other variables (PR = 1.25 for single and PR = 1.30 for separated marital status).

Associations between lower schooling level and depression have been frequently described, with OR from 1.5 to 1.8,³¹ similar to our results (PR = 1.42). However, some studies did not show this relationship because of different definitions of schooling level or because they were carried out in developed countries, where the level is much higher than in this study population.^{35,36}

Regarding poor health status, many studies have shown this association using both screening³⁷ and clinical diagnostic assessments.^{36,38} Findings of the current study are also consistent with this, showing a magnitude of association very similar to those presented in the literature.³¹ OR for depression with good, fair and poor health compared with excellent health were 1.8, 3.1 and 5.6, respectively,³⁹ while in our study, PR were 1.84 and 2.44, for reasonable and bad/very bad health, in that order. Health-related functional impairment, especially in personal and instrumental Activities of Daily Living (ADL) was a risk factor for depressive

disorders with an OR varying from 1.5⁴⁰ to 6.3,⁴¹ and a PR of 1.39 in our study.

Finally, sleep disturbances, particularly insomnia, are also frequently reported as independent predictors of depressive symptoms with magnitudes very similar to those of the current study.^{10,31} The other Brazilian study¹¹ also found an association with female gender, oldest age and lower education. Other comparisons could not be made because the remaining factors investigated were different in each study.

Although our results are very similar to the literature, some methodological issues should be appraised. First, the response rate of this study was over 85%. Therefore the study sample has very high chances of being representative of this population. Second, the magnitude of associations was measured by the PR, which is more conservative than the OR, reducing chances of a type I error. Third, a validated screening scale was used to detect depressive symptoms, unlike in the previous Brazilian study.¹¹

However, in the validation of the GHQ-12 and GDS-30 in this population,⁹ both scales performed insufficiently when compared with the SCAN/ICD-10 diagnosis and could not be recommended as efficient screening measures (the sum of sensitivity and specificity was less than 1.6),⁴² since their use might lead to high rates of misclassification. Also, the cross-sectional nature of the present study allows to establish associations in a specific time frame but causal inferences are precluded. Consequently, the results of the current study must be cautiously interpreted.

In conclusion, this is the first study that used a standardized instrument to investigate factors associated with depressive symptoms in elderly people in Brazil. Although, the GHQ-12 was not designed to assess this population, it did not perform worse than specific scales for this age band.⁹ The similarity between factors associated with depressive symptoms in this population and in others does not explain the high prevalence rates previously reported.^{32,33} Despite methodological limitations, our findings may guide efforts to investigate other factors to elucidate the etiopathogenesis of depression in this population.

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