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Factors associated with performance in the Mini Mental State Examination: a cross-sectional study

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ABSTRACT

Aim: to identify the factors associated with performance in the Mini Mental State Examination (MMSE) on the part of the elderly attending a specialized outpatient clinic. **Method**: a cross-sectional study involving a convenience sample, comprising 216 elderly people waiting for consultation at a specialized outpatient clinic, from March to June 2015, with the application of a structured instrument and the MMSE. For analysis purposes, the study made use of Stata version 12 software, and results were considered statistically significant when $p<0.05$. **Results**: subjects who were female (54%), married (44%), who lived with their spouse (41%) and had low educational level (70%) characteristics predominated. We identified a significant association between MMSE performance and gender ($p=0.001$), education ($p=0.001$), income ($p=0.001$), home companions ($p=0.002$) and individual monthly income ($p=0.001$). **Conclusion**: early identification of cognitive decline and associated factors enables prevention and/or treatment strategies to be implemented by health professionals, especially nurses.

Descriptors: Cognition; Evaluation; Geriatric Nursing; Aged.

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INTRODUCTION

The world is currently experiencing the phenomenon of an aging population, which can be explained by improved quality of life, improved access to health services and the use of technologies in disease prevention and diagnosis, as well as the advancements in the pharmaceutical industry.

As our body ages, there is a decrease in its physiological functions and cognitive changes which may compromise the elderly's health and predispose them to fall[1], with consequent loss of functional capacity[2] and autonomy[3] that will affect their quality of life.

Cognitive complaints are frequent found in elderly people and they represent a risk factor for dementia[4]. These are characterized as one of the main reasons for the institutionalization of this age group. Cognitive disorders are a significant cause of morbidity in the elderly population worldwide, especially in developing countries[5], which currently represent 58% of the world's dementia cases, with a future projection to 71% by 2050[6].

Cognitive assessment is an important tool for the early detection of signs and symptoms related to cognitive loss[7] and is extremely relevant for the planning of health care practice for the elderly in the home, hospital, long-term institutions or community. In this context, the health team should systematically evaluate cognitive changes in the elderly, with special attention to the influence of factors associated with this process. To this end, there are validated protocols and scales. Among these, the Mini Mental State Exam (MMSE) is an instrument that is easy to apply and is widely used for the screening of cognitive impairment, both in clinics and in research practices[8].

The relationship between cognitive performance and associated factors of the non-institutionalized elderly in the national context has been little explored. However, studies highlight female gender[9], advanced age[10], education[11] and comorbidities[5] as variables associated with cognitive deficit.

In view of the above, the goal of this study is to identify the factors associated with performance in the MMSE of the elderly in attendance at a specialized outpatient clinic. It is worth noting that the early identification of cognitive decline enables prevention and/or treatment strategies to be implemented by health professionals, especially nurses.

METHOD

This is a cross-sectional study carried out at the specialized outpatient clinic of a teaching hospital in the Campos Gerais region of Paraná state, from March to June 2015. The institution is characterized as public, and its outpatient clinic deals with, on average, 3,900 visits/month, distributed in thirty medical specialties aimed at users coming from the basic health and Family Health Strategy units, as well as from the other specialty centers of the city and region.

The convenience sample comprised 246 elderly individuals who were individually interviewed while awaiting care in the waiting room of the specialty outpatient clinic. A total of 216 patients were included in the analysis after the exclusion of 30 (11.7%) subjects who did not meet the selection criteria, and 5 of whom (16.6%) did not respond to the MMSE.

We used the following selection criteria for the sample: a) subjects of 60 years of age or older; b) subjects who scored higher than the cut-off point in the MMSE[12]; and c) subjects who were waiting for medical attention on the day of the interview. Elderly patients with a pre-

vious diagnosis of diseases that would prevent participation in the interviews were excluded.

As an initial step in data collection, we applied the MMSE[13], an instrument developed in the United States of America and published in 1975[8], to assess the subjects' mental state, more specifically with regard to dementia symptoms. This is considered the most commonly-used cognitive screening test for adult and elderly population in the world nowadays, with translated and authorized versions for several countries[8]. The instrument includes seven categories related to groups of specific cognitive functions: temporal orientation, spatial orientation, immediate memory, attention and calculation, evocation memory, language and visual constructive capacity. We used, for the cutoff points, the specs validated for the Brazilian population and proposed by authors[12] who carried out a study with 530 individuals from hospital and outpatient areas, with no diagnosed pathologies. The total score ranges from zero to thirty: for illiterate seniors, 13 points; for those with low to middle education, 18 points; for higher education, 26 points[12].

The sample was characterized based on the investigation of the following sociodemographic and clinical variables: gender; age; marital status; education; home companions; financial situation; individual income; diseases; falls (last 12 months); urinary incontinence; use of medicines; and number of hospitalizations (last 12 months), based on the instrument prepared for this study.

We analyzed and tabulated the data using Stata® software version 12. (StataCorp LP, College Station, TX, USA). Initially we submitted the data to exploratory analysis and description in terms of measures of frequency, mean and standard deviation (SD). We checked and normalized the data using the Kolmogorov-Smirnov test. The results obtained in this way confirmed the assumption that the data was normally distributed. We then proceeded to analyze any residues and also considering assumptions, and the results revealed no evidence of violation to the assumption of homoscedasticity or that a transformation of the response or explanatory variable would be necessary. Subsequently, we checked the association between the variables by simple linear regression using the Fisher's F test and the Student's T test, using the $p<0.05$ significance level to evaluate the results.

The project was approved by the Ethics Committee of the State University of Ponta Grossa, under opinion no. 792,978 and CAAE No. 34905214.0.0000.0105. The ethical precepts of voluntary and consensual participation of each subject were respected in accordance with the regulations at the time of the research. The subjects received information about the study and signed a consent form before the interviews were conducted.

RESULTS

In the total of 216 elderly participants, we observed a predominance of women (n=117, 54.2%); married (n=140, 64.8%); with low education level (n=151, 69.9%); in the 60-70 years old age group (n=152; 70.4%), with a mean age of 67.9 years. Individual income was 1 to 2 minimum wages for 175 (81%) of the subjects. A total of 88 (40.7%) of the elderly lived with their spouse (Table 1).

As for the clinical variables, 209 elderlies (96.7%) reported having some type of disease; 146 (67.6%) reported not having suffered any fall in the last 12 months; 134 (62%) did not report urinary incontinence. Still, 203 (94%) used some medication and 148 (68.5%) had not been hospitalized in the last 12 months (Table 1).

Table 1 - Distribution of the sociodemographic and clinical characteristics of the elderly at the specialty outpatient clinic. Ponta Grossa (PR), 2015

Variable	Classification	Total (%)
Gender	Female	117(54.2)
	Male	99(45.8)
Age	60-70 years	152(70.4)
	71-80 years	58(26.8)
	>80 years	5(2.8)
Marital status	Married	140(64.8)
	Single	26(12)
	Widow	50(23.2)
Education*	Illiterate	30(13.9)
	Low	151(69.9)
	Average	22(10.2)
	High	13(6)
Home companions	None	41(8.8)
	Family	87(40.3)
	Spouse	88(40.7)
Financial status	Unsatisfactory	133(61.6)
	Satisfactory	79(36.6)
	Didn't answer	4(1.8)
Individual income (Min. Wages)	0 MW	19(8.8)
	1 to 2 MW	175(81)
	>3 MW	22(4.5)
Diseases	Yes	209(96.7)
	No	7(3.3)
Falls in last 12 months	Yes	70(32.4)
	No	146(67.6)
Urinary incontinence	Yes	82(38)
	No	134(62)
Use of medication	Yes	203(94)
	No	13(6)
Hospitalization in last 12 months	Yes	68(31.5)
	No	148(68.5)

** Education: high (≥8 years of study); Average (4-8 years incomplete); Low (1-4 years incomplete).*
*** National minimum wage at the time of data collection (2015): R$ 788.00.*
Source: Authors' study (2015).

The average score of the participants was 24.5 points (± 2.1) regarding the evaluation of cognitive performance, with lowest and highest scores of 13 and 30 points, respectively. We observed a significant association in terms of the performance in the MMSE with the variables gender (p=0.001), education (p=0.001), home companions (p=0.037) and individual income (p=0.001) (Table 2).

DISCUSSION

Regarding the general characterization of the sample, the findings are similar to the results of national surveys about cognitive aspects in community and institutionalized elderly people, which highlight the predominance of women[11,14], in the age group of 60 to 70 years[3], married[1], with low education level[15], with at least one home companion[11], with earnings between 1 and 2 minimum wages[2] per month and who report diseases[3].

The predominance of the female gender can be explained by the increase in the life expectancy of women and their relatively high demand for treatment and health services[3], considering that the study was carried out in the specialized outpatient clinic of a teaching hospital. This study identified a significant association between cognitive performance and female gender, as found in a cross-sectional epidemiological study conducted in Rio Grande do Sul state with 1,154 elderly residents living at home[3], and a longitudinal research with 2,756 Mexican participants[5].

In the present study we could not confirm an association between MMSE performance and age, in contrast to international and national investigations[10,11]. This fact can be explained by the average age of the participants, which was lower in comparison to the survey conducted with the community regarded as being elderly[15], residents of a community center[2], and residents of LTIIs[16]. The authors point to a higher chance of cognitive deficits in the older elderly[9,10], with a reduction in the scores evaluated by the MMSE[16].

As for education levels, most of the participants have little education (1-4 years incomplete), which is a situation that reflects the lack of access to the educational system of the past generations, especially for women and eco-

Table 2 - Mean scores reached by the elderly in the Mini Mental State Examination, coefficient β of simple linear regression and their confidence intervals (95% CI), according to sociodemographic and clinical variables. Ponta Grossa (PR), 2015

Variables		Avg. MMSE	β coefficient of regression*	95% CI	P Value**
Gender	Male	24.88	-1.51	[-2.42; -0.60]	0.001
	Female	23.37			
Age	-	-	-0.005	[-0.08;0.07]	0.896
Marital Status	Married	24.23	-		
	Single	24.62	0.39	[-2.08; 2.86]	0.757
	Widow	23.56	-0.67	[-1.80; 0.45]	0.236
Education	High	27.84	-		
	Mean	25.40	-2.44	[-4.36; -0.51]	0.013
	Low	24.47	-3.37	[-4.97; -1.78]	0.001
	Illiterate	19.43	-8.41	[-10.24; -6.58]	0.001
Home Companions	Spouse	24.22	-		
	Family	24.25	0.03	[-7.90; -1.75]	0.002
	None	23.80	-0.42	[-1.68; 0.84]	0.511
Financial status	Satisfactory	24.36	-		
	Unsatisfactory	23.60	0.76	[-0.21; 1.71]	0.125
	Didn't answer	23.5	-0.11	[-3.58; 3.37]	0.951
Individual Income (Min. Wage)	-	-	1.12	[0.61; 1.62]	0.001
Diseases	Yes	24.08	-		
	No	23.71	0.37	(-2.25 - 2.98)	0.782
Falls in last 12 months	Yes	24.25	-	[-0.71;1.27]	0.580
	No	23.97	0.28		
Urinary incontinence	Yes	24.06	-0.014	[-0.96;0.94]	0.978
	No	24.07			
Use of medication	Yes	24.04	-0.42	[-2.36;1.52]	0.673
	No	24.46			
Hospitalization in last 12 months	Yes	24.27	0.30	[-0.69;1.30]	0.545
	No	23.97			

** Value of the T test for the Beta coefficient*
*** Result with statistical significance when p<0.05.*
Source: Authors' study (2015).

nomically handicapped individuals. We found significant statistical association between MMSE performance and education, in the same way as in the following cross-sectional surveys: one performed with 310 elderly users of the FHS[11] in the state of Bahia, and another comprising 1,512 residents of 60 years of age or older from the state of Rio Grande do Sul, living in the community[3]. It is relevant to note that a higher education level is characterized as a protection factor regarding cognitive losses[17,18] and works as a stimulus to such functions. In this context, the elderly with relatively few years of education are more likely to present cognitive decline and worse performance in the MMSE[16].

The statistical relationship between cognitive performance and education level reinforces the effect of this variable on the instrument used for cognitive screening, which includes items previously described in the method, and requires reading, writing, attention and calculation, tasks strongly influenced by the subjects' level of education.

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For the home companions, we observed a predominance of elderly people living with their spouse or relative, which can be explained by the participants' marital status and by the fact that the family is configured as a support organization for the elderly, especially when they need specific care measures. Regarding this, a significant association was found between the elderly who live with the family and cognitive performance. Another cross-sectional study conducted with 462 non-institutionalized elderly people from Minas Gerais state, aimed at verifying the association between cognitive ability and the occurrence of falls, identified through the MEEM that the participants who lived with companions presented greater cognitive impairment[1].

The association of cognitive performance in participants living with relatives can be explained by the condition of the elderly presenting cognitive decline that does not allow him or her to live alone. In addition, changes in family structure (separations, cohabitation, unmarried women and/or with no children) complicate its role as a caretaker and protector entity for the elderly, causing a decline in family support that may interfere with cognitive performance. It is also necessary to consider family behaviors that may hinder the independence and autonomy of the elderly, such as infantilizing treatment, lack of incentive for self-care practice, and participation in decision-making processes that involve their daily lives.

This study also found an association between the variable individual income and cognitive performance. This finding is similar to a cross-sectional study carried out with 878 elderly people living in two Brazilian cities[19], which found that elderly people with cognitive deficits had lower income (0-3 minimum wages). In this context, individuals in unfavorable economic situations are at greater risk of cognitive impairment[17], either in developed[20] or developing countries[15]. We understand that unfavorable financial conditions can significantly affect the elderly person's lifestyle and affect their cognitive performance as it relates to their access to adequate food, health services, medication and physical exercise.

We were not able to identify any association regarding the clinical variables with the performance in MMSE. This result differs from that of other studies that reported a relationship with diseases[11], polypharmacy[10] and falls[1].

With regard to the means obtained in the MMSE, the scores achieved were greater than the cut-off point established for illiterates, which indicates the good performance obtained by the elderly in the test. These results are surprising because the majority of the participants presented low levels of education, but they differ from those reported in a cross-sectional study with 24 elderly women living in ILPI, which registered an overall average MMSE score of 19.2 ± 6.8 for the elderly[16].

It should be pointed out that the different criteria for interpreting MMSE results according to the education level of subjects, methodological differences, selection, and sociodemographic and cultural characteristics of the sample make it difficult to compare the scores identified in other studies, especially for the elderly in the community, since most investigations of cognitive performance are performed with institutionalized elderly.

We point out, as a limitation of the study, the convenience sample, composed of elderly patients who were able to go to the hospital, a fact that may have contributed to the non-

-inclusion of individuals with cognitive impairment. We suggest that investigations carried out with this age group might include home visits to collect information, in order to cover the elderly with lower functional performance and who cannot attend an out patient clinic.

The use of only one screening test for the evaluation of cognition is another limiting factor; however, the MMSE is extensively used in national and international research, allowing us to compare these results with findings from other studies. In addition, the cross-sectional design employed, although it does not allow the identification of causal relationships, is widely used for initial diagnoses and for the identification of chronic conditions such as loss of cognitive status.

We suggest that further longitudinal studies are developed in order to verify how cognitive performance is affected by sociodemographic and clinical factors, especially in older, non-institutionalized elderly people in communities.

FINAL CONSIDERATIONS

The study allowed us to identify the performance in the MMSE of the elderly treated in an outpatient clinic specialized in this and associated factors, with an emphasis on subjects' gender, education level, individual income and home companions. Thus, health professionals should frequently evaluate this population, taking into consideration socio-demographic characteristics that may negatively affect their cognitive ability.

The MMSE is a validated, easy and quick-to-apply instrument that allows health teams to implement measures for the screening of cognitive decline in this age group which has practical implications for the elderly and for their quality of life.

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