Factors associated with cognitive performance in elderly caregivers

Principais fatores associados aos domínios cognitivos em cuidadores idosos

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ABSTRACT

Objectives: To explore the socioeconomic, demographic and psychosocial factors associated with cognitive performance in elderly caregivers from Brazil. **Methods:** We evaluated 351 Brazilian elderly caregivers attending primary healthcare services regarding sociodemographic and care variables. Addenbrooke's Cognitive Examination-Revised (ACE-R) domains of orientation/attention, memory, verbal fluency, language and visuospatial were used as dependent variables in the Tobit model. **Results:** Literacy and family income were positively associated with all ACE-R domains. Age, gender, time of care (days/week) were negatively associated with some cognitive domains. Moreover, receiving emotional help and the level of hope were positively associated with specific domains. **Discussion:** The results may be useful for planning interventions aimed at elderly caregivers in order to prevent deficits in the different cognitive domains.

Keywords: Caregivers; cognition; health risk behaviors; primary health care.

RESUMO

Objetivos: explorar os fatores socioeconômicos, demográficos e psicossociais associados ao desempenho cognitivo em idosos cuidadores do Brasil. **Métodos:** Avaliamos 351 idosos cuidadores da atenção primária à saúde em relação a variáveis sociodemográficas e de contexto do cuidado. Os domínios da Escala Cognitiva de Addenbrooke Revisada (ACE-R) - orientação/atenção, memória, fluência verbal, linguagem e visuo-espacial - foram utilizados como variáveis dependentes no modelo de Tobit. **Resultados:** Alfabetização e renda familiar foram positivamente associados a todos os domínios ACE-R. A idade, o sexo, o tempo de atendimento (dias/semana) foram associados negativamente com alguns domínios cognitivos. Além disso, receber ajuda emocional e nível de esperança foram positivamente associados a domínios específicos. **Discussão:** os resultados podem ser úteis para o planejamento de intervenções voltadas para cuidadores idosos, a fim de prevenir déficits nos diferentes domínios cognitivos.

Palavras-chave: Cuidadores; cognição; comportamento de risco à saúde; atenção primária à saúde.

Increased longevity can expose elders to a higher occurrence of chronic diseases, which in turn can generate physical and cognitive decline. Such limitations impose the need for long term care actions, most of which fall upon family members[1].

An important characteristic of caregivers is that this population also largely comprises elderly people[2]. This profile has drawn the attention of the scientific community, given that there is usually a direct relationship between aging and decreased cognitive functions (such as attention, long- and short-term memory, logic reasoning, movement coordination, and planning/executive tasks)[3]. These

functions are all critical in executing the complex activities usually required to perform daily care[4]. The loss of cognitive health of older caregivers can even become a risk to their own self-care, functionality, autonomy, and independence. Various studies have recognized this as an important topic, which can be considered a public health issue.

Studies targeting elderly populations have shown evidence of factors associated with lower general cognitive performance. The literature has highlights various risk factors for cognitive performance, finding a strong relationship between lower education level, socioeconomic conditions,

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and aging-related cognitive deficits[3,5]. These findings are mirrored in studies focused on elderly populations in Brazil[6].

Emotional health is also an important topic when studying cognitive health. It is well-documented in the literature that higher levels of stress caused by the burden of daily care can jeopardize the cognitive health of caregivers[7,8]. According to several studies on African-American and Brazilian elderly populations, depressive symptoms have been linked with lower ranks on global cognitive health scales[7,9].

Researchers have found that cognitive reserve enhancement and engagement in leisure and religious activities[10], physical exercise, having a healthy diet[11], and greater social support can serve as buffers against cognitive decline[12].

By observing the findings of studies that investigate the cognitive health of the elderly population, and considering the distinct characteristics of elderly caregivers, the objective of this study was to explore socioeconomic, demographic, and psychosocial factors associated with the cognitive domains of elderly caregivers in Brazil.

METHODS

Data collection

This was a transversal study that used data gathered in the study "Variables associated with the cognition in elderly caregivers," developed by the "Aging and Health" research group at the Federal University of São Carlos, Brazil. This study selected participants according to the following inclusion criteria: 1) more than 60 years old; 2) attended primary healthcare services in São Carlos, Brazil; 3) caregiver to one dependent elderly person (60 years old or more) living at the same residence. To be considered dependent, the elderly people had to require assistance for at least one activity of daily living and/or instrumental activity of daily living, according the Katz Index[13] and Lawton and Brody scale[14]. The following elements were adopted as exclusion criteria: death of one of the elders at the residence; change of address; and when the elderly individuals could not be reached after three attempts on different days and times. This study did not consider a low cognitive test score to be an exclusion criterion; however, candidates with communication difficulties great enough to prevent their understanding the interview questions were excluded.

The participants were selected from a list supplied by the primary healthcare services (details of the sample selection are described elsewhere)[7]. The researchers identified 594 households: 26 were excluded due to the death of at least one of the elderly individuals; 28 were excluded due to change of address; and 69 could not be reached after three attempts. This left 471 households that were visited, of which 84 refused to participate in the study. Analysis of the remaining 387 residences led to a further 36 being excluded, due to the nonexistence of a caregiving relationship. Therefore, the sample of this study comprised 351 elderly caregivers.

Home interviews were scheduled in advance, and thereafter conducted by trained researchers in a single session, which lasted approximately 1.5 hours. All sessions took place between April and November 2014. The Research Ethics Committee of the Federal University of São Carlos approved this project (nº 416.467/2013).

The following variables were investigated:

1) Sociodemographic characteristics: gender (male or female); age (in years); education (in years); monthly family income (in Brazilian Real); and whether they reside with their children (yes/no);

2) Care characteristics: the number of months the participant has acted as a caregiver; the number of hours/day and number of days/week spent on caregiver activities; the monthly budget dedicated to supporting caregiver activities (in Brazilian Real); participation in any caregiving training course (yes/no); whether the participant receives any material and/or emotional help (yes/no); and whether they receive support from religious groups for caregiving activities (yes/no);

3) Cognition: this variable was measured using Addenbrooke's Cognitive Examination-Revised (ACE-R), which evaluates five different cognitive domains (orientation/attention, memory, verbal fluency, language, and visuospatial). The final metric ranges from 0 to 100. Because the present study aimed to evaluate the influence of caregiver variables on different cognitive domains, we separated the score into ranges as follows: orientation/attention 0–18 points, memory 0–26 points, verbal fluency 0-14 points, language 0–26 points, and visuospatial 0–16[15]. The analyses in this study made continuous use of the patients' scores in the various ACE-R domains;

4) Family functionality: this was measured by using the Family APGAR test, which analyzes satisfaction regarding adaptation, partnership, growth, affection, and resolve. The score can range from 0 to 20, and higher levels indicate good family functionality.[16]

5) Perceived stress: this was measured on the Perceived Stress Scale, which evaluates how stressful people perceive their life situation to be. The score can range from 0 to 56, with higher values indicating higher levels of perceived stress.[17]

6) Hope: evaluated by the Herth Hope Index, which comprises 12 items. The score ranges from 12 to 48 points, where higher values indicate a greater level of hope[18] and

7) Spirituality: the Pinto and Pais-Ribeiro Spirituality Scale was used to evaluate this item. This scale is subdivided into two scales, "beliefs" and "hope/optimism". The values of this scale ranges from 5 to 20, where a higher value means greater agreement with the metric[19].

Data analysis

The data were analyzed using STATA/MP12 software. Given that the caregivers' ACE-R questionnaires were scored from 0 to 100 for the total questionnaire and, within other limitations for its component domains, the models are obviously censored, justifying the use of a cross-section Tobit model presented at equation (1).

$$S_i=\beta_0+\beta_1 \text{Gender}_i+\beta_2 \text{Age}_i+\beta_3 \text{Literacy}_i+\beta_4 \text{FamilyIncome}_i+\beta_5 \text{ResidingWithChildren}_i+\beta_6 \text{TCareYears}_i+\beta_7 \text{TCareHoursDay}_i+\beta_8 \text{TCareDayWeek}_i+\beta_9 \text{MoneySpent}_i+\beta_{10} \text{CaregivingTraining}_i+\beta_{11} \text{MaterialAssistance}_i+\beta_{12} \text{EmotianalHelp}_i+\beta_{13} \text{ReligiousGroup}_i+\beta_{14} \text{PerceivedStress}+\beta_{15} \text{FamilyFunctionality}_i+\beta_{16} \text{Hope}_i+\beta_{17} \text{Spirituality}_i+\mu_i$$
(1)

with,

$$E(S_i \vee x_i, S_i > \text{ll})$$
$$E(S_i \vee x_i, \text{ll} < S_i < \text{ul})$$

Where,

S_i is the ACE-R domain questionnaire score;
ll represents the domain sample lower limit threshold;
ul represents the domain sample upper limit threshold;
$\mu_i \sim \text{IIN}(0, \sigma^2)$;
x_i is the matrix of independent explanatory variables.

This model is calculated by estimating the log-likelihood using iterative methods, therefore the estimation of the proposed Tobit model employed the Newton-Raphson method to maximize the likelihood function.

Likewise, the Tobit model estimation was performed with a robust estimator of variance, in order to avoid bias in the estimators resulting from heteroskedasticity.

RESULTS

The cognitive domains of elderly caregivers in Brazil were associated with various socioeconomic, demographic and psychosocial factors (Table 1). Regarding socioeconomic factors, higher literacy levels and higher income were significantly associated with better cognitive scores in all domains. Regarding demographic factors, male sex was significantly associated with worse orientation scores and older age was significantly associated with worse scores on memory, language and visuospatial tests. Finally, in terms of psychosocial factors, days per week spent caregiving, having emotional help and hope were significantly associated with cognitive performance. More days per week spent caregiving was associated with worse memory and verbal fluency scores. Having more emotional help and hope was associated with higher memory scores. Having more emotional help was also significantly associated with higher language scores.

Table 2 shows the descriptive characteristics of the participants. These are also the exogenous variables that were inserted and tested on the econometric model. The majority was female, with a mean age of approximately 70 years, and a low education and family income. Most gave care throughout the whole week, for six hours/day, and had been caregiving for almost 10 years. The majority did not receive any help in caregiving. As for the recipients of care, the majority were men (69.5%), with an average age of 73.6 years (± 8.57): 86.9% were partially dependent and 13.1% were totally dependent on their caregivers for instrumental activities of daily living.

Table 3 shows the data regarding the five domains of ACE-R that were used as dependent variables in the econometric model.

The estimated parameters of the five Tobit models are presented in Table 1, which also indicates the upper and lower bounds of the data used.

Table 1. Tobit model parameter estimation according to explanatory variables and ACE-R domains. São Carlos, Brazil, 2014.

Variable	Orientation/ Attention	Memory	Verbal fluency	Language	Visuo-spatial
Gender (Male)	-1.148*	-0.200	-0.386	-0.495	-0.627
Age	-0.018	-0.203*	-0.042	-0.173*	-0.07*
Literacy	0.895*	1.882*	0.876*	1.98*	1.448*
Family Income	0.001*	0.0005*	0.0003*	0.0007*	0.0003*
Residing with children (yes)	-0.278	0.297	-0.266	-0.810	-0.149
Time of care (months)	-0.001	0.002	0.000	0.000	0.001
Time of care (hours/day)	0.047	0.069	0.048	0.040	-0.019
Time of care (days/week)	-0.094	-0.624*	-0.323*	-0.247	-0.213
Money spent on care activities (R$)	0.000	-0.001	0.000	-0.001	0.001
Caregiving training course (yes)	1.054	1.191	-0.003	1.796	-0.565
Receives material assistance (yes)	0.455	1.043	0.335	0.243	0.205
Receives emotional help (yes)	0.446	1.293*	0.356	1.59*	0.646
Receives help from religious group (yes)	-0.460	0.795	0.667	-0.803	-0.025
Perceived Stress	-0.001	-0.056	-0.003	-0.040	0.006
Family functionality	-0.001	-0.072	0.013	-0.090	-0.017
Hope	0.101*	0.199*	0.048	-0.034	0.052
Spirituality	-0.111	-0.188	-0.030	0.231	-0.009
_cons	11.622*	23.345*	6.554*	25.119*	10.979*
Upper limit	18	26	14	26	26
Lower limit	0	0	0	0	0

ACE-R: Addenbrooke's cognitive examination-revised; *p < 0.05.

Table 2. Descriptive analysis of the variables analyzed by the econometric model. São Carlos, Brazil, 2014.

Explanatory Variable	n (%)	Mean	SD
Gender (female)	267 (76.1)		
Age (years)		69.56	7.06
Literacy (years)		2.85	1.25
Family Income (R$)		2314.02	1575.13
Residing with children (yes)	50 (14.2)		
Time of care (months)		119.73	155.74
Time of care (hours/day)		6.14	4.84
Time of care (days/week)		6.93	0.56
Money spent on care activities (R$)		188.59	431.72
Caregiving training course (yes)	10 (2.8)		
Receives material assistance (yes)	55 (15.7)		
Receives emotional help (yes)	162 (46.2)		
Receives help from religious group (yes)	18 (5.1)		
Perceived stress		18.60	9.99
Familial functionality		17.09	4.59
Hope		41.21	5.36
Spirituality		18.02	2.42

SD: standard deviation.

Table 3. Descriptive analysis of the ACE-R domains. São Carlos, Brazil, 2014.

Dependent variable	Mean	SD	Min	Max	Possible range
Orientation/Attention	13.69	2.91	3	18	0–18
Memory	14.83	6.26	0	26	0–26
Verbal fluency	5.88	2.93	0	14	0–14
Language	18.43	5.67	3	26	0–26
Visuo-spatial	10.34	3.70	0	16	0–16

ACE-R: Addenbrooke's cognitive examination-revised; .SD: standard deviation.

As shown in Table 1, the results indicate the significance of gender in the orientation/attention domain: it was possible to deduce that males achieved a lower score in this domain. However, there was no indication that gender was a determinant in other domains.

DISCUSSION

The results of this study reveal that most caregivers were women, with advanced age, lower literacy, and lower income. These findings are supported by the existing literature[20,21,22].

The predominance of the female gender reflects the sociocultural role of women as caregivers to their family members[2]. In this study, we found that the male gender recorded lower scores for the ACE-R orientation/attention domain. This finding differs from a previous study on an elderly participant group that did not show a significant statistical difference between genders[23]. This can be explained by the small number of men in the sample, or indicates that this relationship exists only in elderly individuals who are caregivers. We suggest the development of new studies comparing samples of elderly male and female caregivers in order to try to understand this relationship.

The aging process brings about a gradual reduction of neuronal activities, leading to decreased function and thus loss of memory and attention[24]. Our study reflects this, by showing that elderly people of older ages usually report lower cognitive performance (except for the verbal fluency domain). A similar effect is noted in a transversal Brazilian study of 310 elderly people living in the community, where age (older than 80 years) was statistically associated with cognitive deterioration[25]. Another study that corroborates this relationship analyzed 1,606 elderly people over 10 years[26].

The influence of lower levels of schooling in older adults is a theme found in current research[27,28]. This is relevant, especially in developing countries where a significant number of older adults have limited education[23,29]. A study by César et al.[30] evaluated 630 elderly Brazilians in an effort to provide ACE-R norms for seniors with different educational levels. They found that the scores in the separate ACE-R domains, and the total, varied significantly according to the educational level of the sample. For example, the total mean ACE-R score for illiterate individuals was 45.9, while for elderly individuals with 12 or more years of education, the total mean score was 90.1, and this difference was reflected across all five domains. The study also found that the cutoff score to differentiate cognitively normal individuals from dementia in elderly individuals with less than five years of education was 55, while for more educated elderly individuals, it was 63[30]. A study carried out in Brazil with 167 elderly individuals reported that participants with lower education levels showed worse results for visual attention, reaction time, and learning skills. Moreover, it suggested that lower levels of educational achievement during the early stages of life is a greater risk factor than aging for cognitive decay[27]. Another study, using clinical data from three longitudinal studies in England, Wales and Finland, found that individuals with higher formal education during the early part of their life showed a reduction in the risk of clinical dementia[31]. A systematic review, assessing the relationship between educational level and cognitive decay related to aging, reported that individuals with higher schooling usually maintained higher cognitive scores, a fact that could contribute to the prevention of neurodegenerative disorders. However, the same study highlighted that those data should be viewed with caution, as there is a lack of research on people with lower schooling (less than eight years of study)[28]. Therefore, given that our sample predominantly had a low educational level, the relationship between this variable and worse performance in the domains of the ACE-R should be treated with caution, as the cognitive performances presented may be considered normal according to the degree of schooling of the sample. Future studies should evaluate the cognitive performance of elderly caregivers to identify whether their ACE-R scores reflect those of the elderly population in general.

Another factor in this study that showed a strong relationship with cognitive performance was family income. A study of elderly individuals performed in two Brazilian cities verified, by a linear regression, that families with lower income presented with lower cognitive performance. Worse results, according to cognition-based metrics, may be related to this population's limited access to mental stimuli. This may have led to poor sleep efficacy and a worse lifestyle, compromising cognitive capabilities during the aging process[29]. In developing countries, the average family income is between one and three minimum wages[6,29]. In Brazil, most of the income of older adults comes from retirement and pension. In an epidemiological study of older adults in Brazil, only 31% reported that they received enough income to meet their daily needs. This report also showed a relationship between satisfaction with income and health status[23].

An epidemiological study of caregivers described the length of care provided and emotional help received as factors associated with the psychological well-being of this population, especially with regard to perceived burden and stress[32]. The fact of spending more days giving attention to the elderly, and the resultant fewer days available to deal with personal issues, can evolve into emotional issues. Moreover, the lack of motivation for caregiver activities contributes to a reduction in the perceived value of those tasks[32,33]. The present study is a pioneer in examining the influences of different care characteristics on the cognitive performance of elderly caregivers. As there are limits for generalization, analysis of the findings should be made with caution. As an important limitation of this study, the level of dependence by recipients of care on their caregivers was not differentiated. However, given that the elderly individuals were from the community and their degree of dependency did not show great variation, it is believed that these results are consistent in presenting similar burden conditions among the caregivers. It is important to state that we were not able to perform dementia assessments in caregivers, or assessments for mood disorders; in other words, we did not consider data from participants with marked impairments in communication. However, these conditions may be considered as confounding factors in further studies.

In our research, the psychological welfare of the caregivers was a central factor in their cognitive performance. A literature review found that caregivers could present with a cognitive deficit in specific functions, sometimes associated with burden, stress, and depressive symptoms[34]. Another study showed that elderly caregivers living in rural areas, who achieved more than 16 points on the Zarit Burden Interview, lost about 5% of performance on a cognitive test. This same study reported that caregivers with medium or high levels of burden had a cognitive performance worse than caregivers with a lower level of burden[35].

The present research could not identify a relationship between the ACE-R domains and the religion variable, even though the literature has some studies that indicate a relationship between a higher level of religious engagement and mental health, including lower depressive symptoms, stress, and suicidal behavior[36,37].

Since the caregiver's tasks alter his or her daily life routines, adopting this responsibility can cause emotional distress. However, hoping for improvement is what stimulates hope, and this psychological variable is important in the caregiver's evaluation[38]. The hope variable is related to a positive perspective regarding the future, with an effective strategy of coping and the prospect of achieving a significant goal in life. Motivation and hope can collaborate to overcome challenges and to aid in difficult situations such as loss, tragedy, loneliness, and suffering[39]. Snyder et al.[40] defined hope as "a cognitive set that is based on a reciprocally-derived sense of successful (a) agency (goal-directed determination) and (b) pathways (planning of ways to meet goals)". Referring to the cognitive aspect of hope, individuals tend to perform comparative evaluations of the present state (usually related to current problems) with the desirable future state (related to the personal goals)[40]. Thus, hope arises through the cognitive analysis of the absence of something and the desire to obtain a solution. In this context, hope can also be determined by successful past experiences of dealing with affective issues and the current trials, to adjust excessive behaviors and pessimistic thoughts[41]. Therefore, by understanding the correlation between hope, and the orientation/attention and memory domains of the ACE-R, it is possible to understand the relevance of evaluating, encouraging, and valuing the psychological variables among caregivers. In this process, the demands of care themselves can influence how caregivers act. These issues, combined with the elements that influence hope, can contribute to the stimulus of memory and preservation of cognitive domains.

In conclusion, the present study identified various socioeconomic, demographic and psychosocial factors associated with the cognitive domains of elderly caregivers in Brazil. Modifiable factors such as literacy level and family income should be considered fundamental aspects to be improved, to prevent cognitive impairment in elderly caregivers, in long-term public policies. More importantly, scalable interventions that target reducing the time spent in caregiving, increasing emotional support and promoting hope for caregivers are the ones that will probably be more effective in preventing cognitive impairment in elderly caregivers in short term.

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