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COGNITIVE DECLINE IN THE ELDERLY: SCREENING FROM THE ELDERLY PERSON AND HIS/HER INFORMANT

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ABSTRACT

Objective: To analyze the cognitive decline in the elderly using the screening from the elderly person and his/her informant. **Methods:** This is a descriptive, exploratory, cross-sectional study with quantitative approach. The sample was stratified randomly. The cognitive screening instruments were the Mini Mental and the IQ-CODE, and, to test the reliability of the IQ-CODE, the reliability scales ZARIT and CES-D. The data were analyzed with SPSS, using the distribution of frequency (absolute and relative), mean values and standard deviation. In the bivariate analysis, Pearson's chi-squared test and Fisher's exact test were used, with $p \leq 0.05$. **Resulted:** The application of the reliability instruments (ZARIT and CES-D) to the IQ-CODE showed that the decline was prevalent in males from 70 to 90 years, white, unmarried and illiterate (p=0.002). There was an association of the Mini Mental and IQ-CODE when using reliability scales (p=0.018). **Conclusion:** The Mini Mental and IQ-CODE are good instruments for cognitive screening in the elderly and, when used with reliability scales, have proven their association with cognitive decline.

INTRODUCTION

The screening of cognitive decline in the elderly has increasingly interested researchers and clinical studies in the world. The diagnosis of this phase, known as pre-dementia or Mild Cognitive Decline (MCD) is an intermediate moment between the normal aging and the onset of dementia, being important to identify the elderly exposed to this risk (Petersen *et al.,* 2014). The elderly identified with this decline may present dementia in the future and statistics show that this progression occurs in 50% of the elderly population within five years (Albert *et al.,* 2011).

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The American Psychological Association (APA) and the American Academic of Neurology (AAN) recommend, since the 1990's, the identification and monitoring of the elderly (American Psychological Association, 2012). The objective of identifying patients with MDI is to provide conditions of early neurological intervention to prevent or postpone cognitive losses more severe. The early diagnosis and monitoring of dementia syndromes become more effective when using an ideal screening instrument, with quick and easy application, easily interpreted, regardless of the elderly person's cultural, language and schooling level (Petersen *et al.,* 2014). In primary health care, there occur the care to the elderly person and the continuous intervention by public health programs, so this level of attention is the entrance door to the cognitive screening, requiring a service directed at this age group and its particularities.

However, there are some difficulties, such as lack of preparation of institutions, dismantling of the public health service and difficult access to its network of service, as well as the lack of knowledge of professionals about the tests for screening of dementia, which, consequently, are rarely used (Brito *et al.,* 2013). A worrying datum was that a quarter of patients followed-up in primary care with mild cognitive decline tends to present dementia three years after the mild cognitive screening (Kaduszkiewicz *et al.,* 2014). In this perspective, the early identification of signs and symptoms enables the investigation and implementation of interventions that can promote the prevention and minimize the progression of the installed disease, reducing costs with treatment (Petersen *et al.,* 2014). According to the World Alzheimer's Report 2015, the annual cost for the treatment of dementia around the world was US$818 billion and the projections of increasing numbers of cases lead to an estimate of costs around 1 trillion dollars until 2018. Although one of the most used approaches in clinical practice for screening of cognitive deficit is the history of the patient him/herself, this type of action becomes impossible when the patient does not have conditions to assess his/her cognitive losses, due to the low level of understanding resulting from illiteracy or even by the presence of cognitive decline. For this reason, national and international studies consider the need to obtain report of an informant, eligible, due to his/her direct contact with the elderly person and knowledge about the cognitive situation (Sanchez and Berry, 2009).

Therefore, this study is justified by addressing multiple ways for the early screening of the cognitive decline, identifying the profile and the characteristics that may be associated to the presence of this decline and, with it, provide data that may promote specific preventive actions. Based on the exposed, this study aimed to analyze the cognitive decline in the elderly using the screening from the elderly person and his/her informant.

MATERIALS AND METHODS

This is a descriptive, exploratory, cross-sectional study with quantitative approach, performed in the city of Recife, Pernambuco, Brazil. The study population was composed of the elderly and their informants (family members and/or caregivers). The study considered elderly all people aged greater than or equal to 60 years, which is the age group determined for developing countries (Brito *et al.,* 2013). This chronological definition was necessary because it expresses the variables of interest for the study. According to data from the Brazilian Institute of Geography and Statistics (IBGE), in the year 2010, the elderly population of the Health District (HD) IV was 32,960 people. For the selection of the sample, the procedure of random stratification was used in two stages, with the "HD" as the unity of the first stage and the "Family Health Units" (FHU), of the second stage. The HD chosen was the IV and the FHU were the existing 18. The inclusion criteria were 60 years of age or more, not presenting dementia or severe cognitive decline, with established diagnosis, living with the informant for more than ten years, and for the informant, age greater than or equal to 28 years and living with the elderly for more than 10 years. The sample size calculation was performed using the program Statistical Calculators (StatCalc). The following parameters were adopted: population of 32,960 elderly people belonging to the HD IV, considering the confidence interval of 95%; and sampling design effect

equal to 1.0. Since this study covered the analysis of multiple variables and with different frequencies of occurrence, the estimated prevalence was 50%, which resulted in an estimated total of 244 elderly people and their informants, after excluding the losses, the final quantitative was of 220 elderly people and their informants, totaling a final sample of 440 individuals. The instruments used were divided into two parts, the first related to forms that have been applied to the elderly, which followed the sequence: socioeconomic characterization elaborated from the Brazilian Association of Research Companies (ABEP - *Associação Brasileira de Empresas de Pesquisa*) and the cognitive status through the Mini Mental State Examination (MMSE). The second part related to the informant, analyzing the socioeconomic characterization and the Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE), which seeks to identify the perception of the elderly person's cognition through the responses of the informants. To increase the reliability of the informants, the Brazilian version of the Center for Epidemiologic Studies Depression Scale (CES-D) and the Caregiver Burden Scale in the Brazilian version of ZARIT were concomitantly used.

Before data collection, a pilot study was conducted with 10% of the sample, totaling an amount of 25 elderly people and their informants totaling 50 individuals in a FHU of HD IV. This moment occurred in two phases: in the first one, there was a training, with the aim of standardizing data collection and, after the understanding of all participants, the interviewers were separated into two groups: group I (interviewers of the elderly) and group II (interviewers of informants). This strategy was designed to minimize possible errors and improve the application through the process of repetition. At the end of the implementation of the instruments, possible biases and limitations were identified in the procedures. Besides the researcher, five students from the last semester of the undergraduate nursing course participated as research assistants.

The period of thirty days for the completion of the pilot study was not possible, because, during implementation, the outbreak of Arboviroses occurred in Pernambuco and Community Health Agents (CHA), who accompanied the researchers to the residence of the elderly, were scaled for actions related to the peculiar and severe epidemiological situation, hampering the completion of the pilot test within the prescribed time limit. Upon this fact, the pilot study lasted three months (September through November 2015), generating the need for redeployment of the planned deadlines. With these difficulties, a new strategy for data collection was organized, with a new action directed to include a larger number of the elderly and their informants, with the purpose of collecting the data. This action was performed at a public school provided by the HD IV and the flow occurred with the reception and identification of the elderly and their informants by two receptionists who collected the identification data, subsequently separating each pair with adhesives with the same numbering for both with different colors, with the red for the elderly person and the green, for his/her informant. After the identification, the receptionists directed them to different rooms, where the forms were applied. In one room, there was a coordinator and an interviewer of the elderly and in another room, a coordinator and an interviewer of the informants. After data collection, the elderly and their informants were sent to a lecture room with social themes, geared to the interests of the elderly and their informants.

At the end, everyone participated in the memory bingo, being this strategy composed of questions and answers about various events and personalities from various times, engravings of varied themes and complement of lyrics, with the purpose of activating memory, executive function and visual-spatial skills This fact was thought of as a post-collection activity by the researcher, aiming at social return and the possibility of a preventive action to improve the cognition of elderly patients participating in the study, as observed in the study of systematic review of Simon, Yokomizo and Bottino (2014), who concluded that the cognitive exercises promote greater activation of the brain, with improvement of symptoms of depression and anxiety, leading to an increased quality of life and well-being of the elderly person. These strategies are being used as non-pharmacological treatment for the prevention of cognitive decline.

In the end, the coordinators and research assistants assessed the compatibility of collection instruments of the elderly person and his/her informant through the numbering and conference of names. This step was completed with the final revision of the researcher. After the action and with the gradual return of CHA to their normal functions, the search returned to the initial methodology, in which the researcher and the assistants returned to the FHU to contact the nurses from the units and schedule home visits. At the end of the research, a full coverage of the FHU of HD IV was carried out. The data collection occurred in the period of seven months (September/2015 - April 2016). The study followed the ethical standards for researches involving human beings, according to resolution 466/12 and was approved by the Research Ethics Committee (REC) of the Federal University of Pernambuco (UFPE) under CAAE n.: 13374513.9.0000.5207. All the elderly and their informants signed the Informed Consent Form (ICF). The data were processed using the Microsoft Excel program, through dual typing and analyzed using the Statistical Package for the Social Sciences (SPSS), version 16 (SPSS Inc., Chicago, IL, United States of America, Release 16.0.2, 2008), employing descriptive statistics for categorical variables, distribution of frequency (absolute and relative) and for the numerical variables, mean and standard deviation values were calculated. In the inferential bivariate analysis, the Pearson's Chi-squared and Fisher's exact tests were used to analyze the associations in cognitive decline in the elderly. In all tests applied in this study, there was statistical significance when p value ≤ 0.05.

RESULTS

The study participants were 220 elderly people with their caregivers. Table 01 outlines the profile of the elderly with or without cognitive decline, according to the Mini Mental. On average, the elderly who presented the cognitive decline, according to the Mini Mental, are almost 76 years ± 9.74, with age ranging from 63 to 94 years. The average age of the elderly without cognitive decline is of 73 years ± 7.98, in an age group from 60 to 94 years. Concerning the division of age, there was no statistically significant difference regarding the age of the elderly, in which 60 |- 70 years 27.8% (p=0.463); 70 |- 80 37.3% (p=1); 80 |- 90 48% (p=1); 90+ 71.4% (p= 0.176).
Of the 220 elderly people surveyed, only 94 completed the Mini Mental test. This characteristic of 126 lost forms occurred due to the elderly not responding questions in which they had difficulties, related to the degree of schooling.

The results of table 2 outline the profile of 220 elderly people, according to the presence or absence of cognitive decline, as measured by the IQ-CODE without reliability. On average, the elderly who presented cognitive decline according to the IQ-CODE are almost 79 years ± 8.5 years, with age ranging from 60 to 96 years. The average age of the elderly without cognitive decline is of 73 years ± 8.2 years in a range that goes from 60 to 93 years. Regarding the division of age group, there was a statistically significant difference in the age ranges of 60 |- 70 years and 90+, but, in a general way, the age groups presented the following prevalences, between 60 |- 70 years 8.3% (p=0.000); 70 |- 80 37.3% (p=1.000); 80 |- 90 48% (p=1.000); 90+ 71.4% (p= 0.176).

Table 3 showed that, among the elderly participants with cognitive decline, the variables age and its ranges 60 |- 70 years 8.3% (p=0.000); 70 |- 80 37.3% (p=1); 80 |- 90 48% (p=1); 90+ 71.4% (p= 0.176), sex (p=0.350), color (p=0.687), marital status (p=0.200) and social stratum (p=0.198) showed no statistical significance, however education (p=0.002) showed a strong association for cognitive decline. The other two questionnaires are important for increasing the reliability of the IQ-CODE instrument, which are the questionnaires CES-D and Zarit, referring to the informant, have the purpose to give reliability to the IQ-CODE, because the IQ-CODE is an instrument responded by the informant in relation to the elderly person, thus, the CES-D classifies the informant regarding a possible depression and the Zarit classifies the informant for a possible work overload. Therefore, informants who do not have overload nor depression, have the reliability to answer the IQ-CODE questionnaire. Among the 220 interviewees, the CES-D instrument identified that 55.5% of them have depression and the instrument ZARIT indicates that 49.5% presented some degree of overload. Additionally, 68 interviewees (31%) did not present any degree of depression or overload, resulting in 68 IQ-CODE questionnaires with reliability.

In order to verify whether an association exists between the Mini Mental and IQ-CODE instruments, a bivariate analysis was used for the IQCODE without and with reliability, from the application of the CES-D and the ZARIT. In the analysis without reliability of the IQCODE, the sample size is 94, resulting from the crossing of the 94 Mini Mental questionnaires and 220 IQ-CODE questionnaires. In this analysis, Pearson's chi-squared test showed a p-value of 0.089, with no evidence of association between the questionnaires.
When applying the reliability of the aforementioned questionnaires, the size of the sample decreases to 33, due to the crossing of the 94 Mini Mental questionnaires and 68 IQ-CODE questionnaires with reliability. In this case, Fisher's exact test provided a p-value of 0.017, showing an association between the instruments. This finding shows that the use of the CES-D and ZARIT instruments is necessary for reliability in the IQ-CODE. As observed in table 4.

DISCUSSION

The cognitive decline assessed by the response of the elderly to the Mini Mental related to the variable sex showed higher prevalence for males, but with little variation when compared to females. This finding may indicate that, even with a greater number of women in Brazil, there was a higher prevalence of cognitive decline in elderly males.

Table 1. Profile of the elderly with or without cognitive decline according to the Mini Mental. Recife, Pernambuco (PE), Brazil, 2016

Characteristic	Category	Absence		Presence		P-Value
		N	%	N	%	
Sex	Female	59	80.8	14	19.2	0.051
	Male	16	76.2	5	23.8	
Skin color	White	20	76.9	6	23.1	1
	Black	16	94.1	1	5.9	
	Pardo	29	76.3	9	23.7	
	Others	10	76.9	3	23.1	
Marital Status	Married/Stable Union	29	76.3	9	23.7	0.229
	Widow(er)	30	75.0	10	25.0	
	Others	16	100	0	0.0	
Education	Illiterate	51	86.4	8	13.6	0.032
	Others	24	68.6	11	31.4	
Social Stratum	A and B	9	90.0	1	10.0	0.212
	C	27	73.0	10	27.0	
	D and E	39	83.0	8	17.0	

Table 2. Profile of the elderly with or without cognitive decline according to the IQCODE Recife, Pernambuco (PE), Brazil, 2016

Characteristic	Category	Absence		Presence		P-Value
		N	%	N	%	
Sex	Female	130	75.6	42	24.4	0.745
	Male	38	79.2	10	20.8	
Skin color	White	41	74.5	14	25.5	1.000
	Black	28	77.8	8	22.2	
	Pardo	75	76.3	23	23.7	
	Others	24	78.1	7	21.9	
Marital Status	Married/Stable Union	62	78.5	17	21.5	0.698
	Widow(er)	62	70.5	26	29.5	
	Others	44	83.0	9	17.0	
Education	Illiterate	81	68.1	38	31.9	0.003
	Others	84	85.7	14	14.3	
Social Stratum	A and B	17	81.0	4	19.0	0.802
	C	63	75.9	20	24.1	
	D and E	88	75.9	28	24.1	

Table 3. Profile of the elderly with or without cognitive decline according to the IQCODE with the reliability of the ZARIT and CES-D scales. Recife, Pernambuco (PE), Brazil, 2016

Characteristic	Category	Absence		Presence		P-Value
Sex	Female	44	89.8	5	10.2	0.350
	Male	16	84.2	3	15.8	
Skin color	White	12	80.0	3	20.0	0.687
	Black	12	92.3	1	7.7	
	Pardo	29	90.6	3	9.4	
	Others	7	87.5	1	12.5	
Marital Status	Married/Stable Union	20	87.0	3	13.0	0.200
	Widow(er)	27	90.0	3	10.0	
	Others	13	86.7	2	13.3	
Education	Illiterate	29	82.9	6	17.1	0.002
	Others	31	93.9	2	6.1	
Social Stratum	A and B	7	70.0	3	30.0	0.198
	C	20	83.3	4	16.7	
	D and E	33	97.1	1	2.9	

Table 4. Association of the Mini Mental with the IQCODE, in relation to the reliability of the instrument Recife, Pernambuco (PE), Brazil, 2016

IQCODE		Mini Mental		Bivariate Analysis	
		Absence	Presence	OR (95% IC)	P-Value
Without reliability	Absence	60	11	2.909 (0.996; 8.499)	0.089
	Presence	15	8	1	
With reliability	Absence	26	2	19.500 (1.964; 193.639)	0.018
	Presence	2	3	1	

* Significant association at 5%.
†Through Pearson's Chi-squared test.
‡ Through Fisher's Exact test.

The international study conducted in Olmested County in 2010 with 2,050 elderly patients showed similar results, with a higher prevalence of elderly males with cognitive decline, and complemented reporting that men are 1.5 more likely to present cognitive decline in the elderly phase. This fact can be explained, because it is believed that the cognitive decline in males manifests earlier, but less abrupt (Petersen *et al.,* 2010). In 2012, a longitudinal study was conducted, also finding a higher prevalence of cognitive decline (CD) in males, showing that 43.9 men showed CD every 1000, in which the result shows synergy between sex and schooling and proposes that men with low schooling has high risk of cognitive decline (Roberts *et al.,* 2012). Concerning schooling, a multivariate analysis study in Rio Grande do Sul found a strong association of cognitive decline in elderly patients who had less than eight years of schooling, Furthermore, a cross-sectional study also conducted in South Brazil found that the low educational level is associated with cognitive decline (Cabrera *et al.,* 2016).

In relation to international publications, a longitudinal study, performed in Manhattan, with 3,435 elderly patients, showed that up to eight years of study at the beginning of life is associated with cognitive decline in aging. In contrast, the elderly who have 9-20 years of study in the life course acquire protective neurological factors against the decline (Zahodne, Stern and Manlyn, 2015). Regarding the relationship of the mini mental with the variables marital status and social stratum, there was no statistically significant difference. However, a cross-sectional study with 454 elderly people, in Minas Gerais, in the year 2015, applied in primary care, found results similar to this study, in which the cognitive decline was related to the situation of widowhood, because the emotional impact of losing the spouse can generate effects that weaken the health of the elderly and predisposes to cognitive decline (Cruz *et al.,* 2015). A European longitudinal study found similar result, carried out in Iceland, with 4,370 elderly, which showed that widowers for less than two years presented greater cognitive decline that the married elderly (Vidarsdottir *et al.,* 2014). Referring to social stratum, taking as a reference the ABEP, there was an equivalent result with the present study, because the research performed in Minas Gerais in basic care, identified the class C as the most prevalent regarding cognitive decline in the elderly, showing that, although different geographic regions, low income had a relationship with the cognitive decline (Cruz *et al.,* 2015).

In a national study that evaluated various Brazilian realities, the cities with lower incomes were Parnaíba in Piauí, Campina Grande in Paraíba and Belém in Pará, which may infer that, in these cities, the risk of cognitive decline in the elderly is more prevalent (Neri *et al.,* 2013). Developing preventive strategies for cognitive decline allows for preventing dementia and Alzheimer's disease, because the cognitive decline is a transition phase between normal neuronal function and the clinical onset of the disease (Vega and Newhouse, 2014). International studies have demonstrated that there is no pharmacological treatment for cognitive decline (Wong *et al.,* 2016). With respect to non-pharmacological treatments, the international studies pointed out that there are three methods already proven beneficial for the prevention of cognitive decline. The first relates to cognitive exercises, which work memory, executive function and visual-spatial skills and concluded that there was a greater brain activation and best response to the scales used, with improvement in the scores for depression and anxiety, leading to an increase in the quality of

life and well-being of the elderly (Simon, Yokomizo and Bottino, 2014). The second treatment used meditation as a way of preventing and delaying the progression of the disease, since the process of concentration and the practice of attention can increase the gray area of the hippocampus and prefrontal area, favoring a better neuronal connectivity. The third method favors the physical exercise as a protective factor against the cognitive decline for the elderly, because it showed an association with the preservation of cognition in aging, being intensified if the elderly person has no depression and has a social circle (Petersen *et al.,* 2014). In Table 02, regarding age, the cognitive decline occurred in the oldest participants. A Swiss international study with 172 elderly people also found this characteristic, with a mean of 71.05 ± 8.8 years, not being observed greater variations in the age range (Ehrensperger *et al.,* 2010). In relation to sex, in a study conducted in Turkey with 900 elderly people, there was a predominance of the cognitive decline in females (Arguvanli *et al.,* 2010). This characteristic of the feminization in cognitive decline, according to the perception of the informant, can result from the similarity of genders, fostering greater exchange of information, taking this caregiver to a greater perception of the cognitive status of the elderly person. In what concerns the relationship between education/cognitive decline in international studies, there was similarity with the national findings, because, in a longitudinal study conducted in the United States, the elderly with less than eight years of study showed a higher risk of developing the cognitive decline in aging (Zahodne, Stern and Manlyn, 2015).

In relation to the IQ-CODE, a systematic review found that the IQCODE is a questionnaire that can be used for screening of cognitive deficit, because it is little affected by educational level, premorbid ability, culture and the dominant language. Nevertheless, it is affected by the characteristics of the informants, such as mental health and the quality of relationship between the informant and the elderly person. Further complementary tests should be done in order to increase the reliability of the instrument, because the informant with depressive symptoms presented with reduced motivation, attention and concentration (Steffens and Potter, 2008). With the purpose of improving the reliability, another characteristic needs to be verified, such as the influence of the caregiver overload in the response on the cognition of the elderly person. Given such information, the level of burden and the mood of the informant are factors that may compromise the information, thus the need to select the informants regarding depressive symptoms and burden, because it minimizes the risk of decreased reliability of information about the mental state (Sanchez, 2007). A Spanish study with 416 elderly individuals that used the complementary test crossing the IQ-CODE and the CES-D in order to increase the reliability, and concluded that, for the screening of cognitive decline, the instruments that increase the credibility of the responses should be strictly used (Del Ser Quijano *et al.,* 2004). Before this indicative of use of various instruments, a cross-sectional study conducted in 19 large-, mid- and small-sized cities Norway, with 998 elderly, in urban and rural areas, showed a strong association between the MMSE and the IQCODE. This association showed that the IQCODE applied in isolation recognizes the elderly with cognitive decline from the perception of the informant and the MMSE identifies it from the response of the elderly, but, when performing the intersection between the mentioned tools, there was an expansion of cognitive screening, allowing to identify all

possible cases (Kirkevold and Selbaek, 2015). The MMSE depends on the level of education, ethnicity and mental capacity, so that it can identify erroneously people with less than eight years of study (Pedraza *et al.,* 2012). Nonetheless, people with the highest level of schooling may have a preserved memory capacity, but deficiency in personality, behavior and performance of activities of daily living (ADL), preventing the screening by the MMSE, being necessary the concomitant application of the IQCODE to screen the elderly in decline, but with preserved memory (Kirkevold and Selbaek, 2015). As for the IQCODE instrument, a study carried out in Rio de Janeiro acknowledged the relevance of the concomitant use of the MMSE and the IQCODE for screening the cognitive decline in the elderly and alerts on the care necessary for applying the IQCODE, because the informants may not present with depressive or burden symptoms, since these conditions result in possible erroneous answers about the cognitive condition of the elderly person, thus recommending the application of instruments, such as the CES-D and ZARIT scles, to identify these conditions and increase the reliability of the IQCODE responses (Del Ser Quijano *et al.,* 2004).

Conclusion

There was change in the profile of the elderly when compared with or without reliability, demonstrating the need to associate the screening of cognitive decline with the scales that minimize the risk of error. However, it is necessary to carry out further studies that can identify this causality. When assessing the association of the Mini Mental and the IQCODE, the statistics showed strong association when using instruments of reliability, excluding the informants with depressive symptoms and burden. Therefore, the applicability of the instruments for reliability in cognitive decline should be encouraged, because it minimizes the risk of bias. The expectation is that, with this study, new studies will be performed by longitudinal method investigating the cognitive decline in specific groups, separating them by gender, social stratum and age, seeking to set out the predominant factors in cognitive decline in this population. Moreover, the screening of cognitive decline should be performed with the combination of varied instruments to increase or refute the combination of used tests, with the aim of testing and reveal the causalities.

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