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Original Article

Selective cognitive screening in the community: A Portuguese sample

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ABSTRACT

Background/Objective: Dementia is a chronic and incurable disease. To prevent a nursing home premature admission, the diagnosis should be made as earlier as possible. In 2003, our group found that primary care services had an insufficient identification and referral rate to secondary care of depression and dementia cases in the elderly population. Our hypothesis was that day center population was the most at risk of dementia (nursing homes/residential care homes being already with moderate to severe dementia and in local parish councils only with mild cognitive impairment), being the population which an early intervention would have a major impact.

Methods: We did a selective cognitive screening study in the community. It consisted in a brief clinical interview and the application of Mini-Mental State Examination, Clock-Draw Test and Geriatric Depression Scale, creating a composite referral criterion. Individuals were referred and secondary analysis were done.

Results: The screenings were done in 18 day centers (DC), 2 local parish councils (LPC) and 7 nursing homes (NH) in individuals without previous psychiatric/neurologic diagnosis. Five hundred and seventy-nine users were identified, 74% females. Referral criteria was met in 81% of NH, 56.8% in DC and 22.1% in LPC. Single individuals were significantly associated with lower cognitive score and married individuals with a higher score.

Conclusion: There were a significant amount of people with cognitive impairment without a current diagnosis or adequate treatment plan. All individuals in DC should be assessed and prevention interventions should be implemented in LPC. Psychosocial network and daily social interactions should be further studied.

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INTRODUCTION

Dementia is a chronic and incurable disease, with a worldwide incidence estimation of 9.9 million new cases in 2015 and prevalence estimation of 46.8 million.[1] This makes dementia a relevant public health problem and an urgent intervention is needed.[2]

Several studies have investigated the economic impact of cholinesterase inhibitors and memantine in the economic burden of Alzheimer Disease. There is some controversy

about the best method to calculate the impact. The simplest model is to calculate the time from diagnosis to nursing home admission.[3] In this view, several studies have shown the advantage of these medication in delaying the admission, preventing additional costs.[4] Also a non-pharmacological intervention with a brief program of support for relatives at time of diagnosis showed a decrease in nursing home admissions.[5] This method of calculating the costs is insufficient but it gives a clear and basic strategy of intervention-preventing the admission to a nursing home.[6]

To prevent a premature admission to a nursing home, the diagnosis should be made as early as possible. An early diagnosis leads to an earlier treatment. An early treatment and engagement with the caregiver delays the admission to a nursing home, preventing the caregiver burnout, a factor leading to admission.[7-9] One of the best intervention to achieve the goal of early diagnosis is screening individuals. A selective screening of the individuals at high risk would be the most feasible to implement.[10] Also, the acceptance of a screening process depends on several factors: the patient perception of the disease being screened, the available health care responses and the socioeconomic status.[11,12] There's a suggestion that this screening process should be based on primary health care teams.[12]

In 2003, our group did a pilot study in primary health care to access the needs of the population in the influence area. The results showed a marked insufficiency in cognitive assessment in primary care, with a high number of dementia and depression cases not identified and not referred.[13]

In 2010 our team started a new outreach project, a selective screening of individuals in day centers, nursing homes and local parish councils. Our hypothesis was that day center population would have a higher risk of having an undiagnosed dementia (nursing homes being already with moderate to severe dementia and in local parish councils being only with mild cognitive impairment) and having the most benefit from an early intervention.

In the first part of our project, our objective was to selective screen individuals without the diagnosis of dementia for cognitive impairment and make a priority referral to our community teams. We also made a secondary analysis to evaluate some known risk factors.

METHODS

Through 2010 to 2014, we implemented a selective cognitive screening study in the community, in the county of Oeiras and Sintra, Portugal. The project was presented in a network of social support institutions to the elderly. The institutions that accepted to participate in the project had their users screened for cognitive deficits and depressive symptoms. When appropriated, the users were referred for a psychiatric evaluation. The screenings was done in the institution of the user. The inclusion criteria was age equal or superior to 60 years old and the exclusion criteria having psychiatric or neurologic regular appointments (Figure 1).

The screenings were done by a neuropsychologist in day centers (private non-profit non-governmental organizations), local parish councils and nursing homes. They consisted in a brief clinical interview, the Mini-Mental State Examination (MMSE), the Clock-Draw Test (CDT) with the Rouleau scoring system and the Geriatric Depression Scale (GDS).[14-17] The mean time of screening was 15 minutes.

The screenings were considered positive if the result was below the cutting points validated for the Portuguese population (MMSE according to education: if education shorter or equal 2 years a cognitive impairment was determined bellow or equal to 22 points; if education between 3 to 6 years the cutoff was 24 points; above 6 years of education, the cutoff was 27 points;[14] CDT <7 points;[15] GDS severe depression score - between 20 and 30 points)[17] and a qualitative analysis to evaluate the memory deficits and executive function. In the final part, the results were presented to the individual. A psychoeducation intervention was delivered to the individual, family and health professionals, to the need of specialized medical assessment. The referral decision was based in MMSE or CDT below the cutoff. A severe result in GDS was also considered.

Demographics were collected from every individual. As the individuals were assessed alone, we opted to use the generic term of "psychiatric or neurologic history". This was done to avoid recall and misinformation bias about previous diagnosis.

The statistical analysis of outcome variables was done according to the type of outcome variable and grouping variable. The analysis of dichotomous variables were done with χ^2; of continuous variables with independent two-sample t-test. To test the categorical grouping variable one-way analysis of variance was used for continuous outcome variables and with χ^2 or analysis of variance for categorical variables. Primary analysis focused in the screening variables and tested according to the place where it took place. The secondary analysis tested risk factors (age, sex, education, marital status, psychiatric and neurologic history) using linear and logistic regression models (according to outcome variable type) to assess the probability of different factors being associated with a positive result in the screening. A multivariate model was created for cognitive and for mood assessment according to biological plausibility and significant associations in univariate analysis. All analysis were done with SPSS® version 22.

RESULTS

Primary analysis - Screening

Demographic

The screenings were done in 27 institutions, 7 nursing homes, 18 day centers and 2 local parish councils. The number of individuals screened was 579, with 74% females. Age screened was between 65 and 94 years, with a mean of 80.3 years and a standard deviation of 8.4 years. The marital status was 57% widowers, and 85% had up to

4 years of education. In day centers were screened 370 individuals, 105 in nursing homes and 104 in local parish councils. Individuals in day centers had a mean age of 81.3 years (standard deviation [SD] 8.1 years), most being widowers (62.4%) and a mean of 3.7 years of education (SD 3.3 years). In nursing homes had a mean age of 84.4 years (SD 7.1 years), most being widowers (68%) and a mean of 3.6 years of education (SD 3.6 years). In local parish councils had a mean age of 72.9 years (SD 6 years), most being married (71.2%), and a mean of 3.4 years of education (SD 1.7 years). Further demographics are available in Table 1.

Cognitive assessment

In the place of screening with more autonomous patients, higher results in cognitive assessment were found (Table 2). In the local parish councils the average of MMSE was 25.9 (SD 4.6) and for CDT was 7.1 (SD 2.6). In the day centers the mean for MMSE was 21.0 (SD 7.6) and for CDT was 3.8 (SD 3.7). In the nursing homes the mean for MMSE was 17.8 (SD 7.7) and for CDT was 2.3 (SD 3.4).

Mood assessment

The majority had mild to moderate depression ratings in GDS, without statistical significant differences between groups (Table 2). The raw score was higher in day centers, having more individuals scoring severe depression than in other places studied.

Referral

Individuals meeting referral criteria were identified in the different places of the study. In nursing homes individuals meeting referral criteria were 82.9%. In day centers the proportion was lower (58.1%) and the lowest was in local parish councils (22.1%) (Table 2).

After analyzing the data from first appointments in the community mental health teams, having only data from Oeiras, only 15.7% (50 of 318) had an appointment after the positive screen.

Secondary analysis - Risk factors

Cognitive assessment

Age, education, marital status and place of screening had significant association with the outcome in univariate analysis and were chosen for the multivariate model. Sex, neurological and psychiatric history were not statistically association and place of screening showed a statistical trend (Table 4) with the outcome (Table 3). In the multivariate model, age, education and marital status maintained their association and place of screening showed a statistical trend (Table 4). The multivariate logistic regression model has a likelihood ratio χ^2 test of 97.1 and a p-value of <0.001. With this finding, we individually tested the marital status and transformed it to four dichotomous variables and tested in multivariate models. We found that being single was associated with a statistically significant increased risk of being screened as positive and being married with a statistically significant decreased risk (Table 4). We additionally tested the interaction between place of screening and marital status and it showed a statistically significant interaction.

To better understand the interaction, we studied the marital status according to place and gender. Married individuals have lower risk in local parish council and day center

Table 1. Demographic characteristics and results

	Nursing Home		Day Center		Local Parish Council		Total	p-value
	n=105		n=370		n=104			
	Mean	SD	mean	SD	Mean	SD	n	
Age, years	84.4	7.1	81.3	8.1	72.9	6.0		<0.001
Education, years	3.6	3.6	3.7	3.3	3.4	1.7		0.680
	N	%	N	%	N	%		
Gender								
Feminine	75	71.4%	290	78.4%	66	63.5%	431	0.006
Marital status								
Married	7	6.7%	58	15.7%	74	71.2%	139	<0.001
Divorced	8	7.6%	25	6.8%	3	2.9%	36	
Single	18	17.1%	55	14.9%	3	2.9%	76	
Widower	72	68.6%	232	62.7%	24	23.1%	328	
Psychiatric history	18	17.1%	57	15.4%	16	15.4%	91	0.910
Neurologic history	33	31.4%	102	27.6%	15	14.4%	150	0.009
Residence								
Oeiras	95	90.5%	327	88.4%	0	0.0%	422	<0.001
Sintra	10	9.5%	43	11.6%	104	100.0%	157	

Statistical analysis: ANOVA and X^2; GDS=Geriatric Depression Scale; MMSE=Mini Mental State Examination); CDT=Clock Draw Test; SD=standard deviation.

Table 2. Results of cognitive and mood assessment and individuals meeting referral criteria

Cognitive And Mood Assessment	Nursing Home	Day Center	Local Parish Councils	p-value
	n=105	n=370	n=104	
MMSE, mean (SD)	17.8 (7.7)	21.0 (7.6)	25.9 (4.6)	<0.001†
Female, mean (SD)	17.2 (8.1)	20.7 (7.8)	25.6 (4.0)	<0.001‡
Male, mean (SD)	19.4 (1.2)	22.1 (6.7)	26.4 (5.5)	<0.001‡
Married, mean (SD)	21.4 (7.0)	23.3 (7.5)	27.0 (4.2)	<0.001‡
Single, mean (SD)	17.9 (5.8)	19 (7.8)	25.7 (2.9)	0.238‡
Divorced, mean (SD)	13.1 (11.6)	24 (5.2)	28.7 (1.6)	<0.001‡
Widower, mean (SD)	18.2 (7.5)	20.7 (7.4)	22.3 (4.3)	0.017‡
CDT, mean (SD)	2.3 (3.4)	3.8 (3.7)	7.1 (2.6)	<0.001†
GDS, mean (SD)	14.0 (7.8)	15.4 (7.1)	14.1 (7.2)	0.099†
Severe, n (% according to local)	29 (28.7%)	111 (31.2%)	30 (28.8%)	
Mild / moderate, n (% according to local)	40 (39.6%)	160 (44.9%)	41 (39.4%)	
Without, n (% according to local)	32 (31.7%)	85 (23.9%)	33 (31.7%)	
Referral Criteria				
Doesn't meet criteria, n (% according to local)	18 (17.1%)	155 (41.9%)	81 (77.9%)	<0.001†
Meet criteria – Altered MMSE, n (% according to local)	81 (77.1%)	159 (53.5%)	20 (19.2%)	
Meet criteria – Altered CDT and severe score GDS with normal MMSE, n (% according to local)	6 (5.8%)	12 (4.6%)	3 (2.9%)	

†Statistical analysis: X^2; ‡Statistical analysis: analysis of variance.

Table 3. Analysis of predictors of meeting referral criteria and severe score in GDS

	Referral					GDS				
	Non-Case		Case		p-value	Non-Case		Case		p-value
	n=339		n=240			n=409		n=170		
	mean	SD	mean	SD		mean	SD	mean	SD	
Age, years	78.7	8.3	82.5	8.1	<0.001	80.0	8.6	81.0	7.9	0.200
Education, years	4.2	2.9	3.6	3.3	<0.001	4.0	3.2	2.8	2.6	<0.001
	n	%	n	%		n	%	n	%	
Gender										
Feminine	253	74.6%	178	74.2%	0.174	288	70.4%	143	84.1%	<0.001
Marital status										
Married	106	31.3%	33	13.8%	<0.001	108	26.4%	31	18.2%	0.086
Divorced	19	5.6%	17	7.1%		28	6.8%	8	4.7%	
Single	33	9.7%	43	17.9%		54	13.2%	22	12.9%	
Widower	181	53.4%	147	61.3%		219	53.5%	109	64.1%	
Psychiatric history	53	15.6%	38	15.8%	0.242	53	13.0%	38	22.4%	0.005
Neurologic history	89	26.3%	61	25.4%	0.878	100	24.4%	50	29.4%	0.210
Place of screen										
Day Center	155	61.0%	215	66.1%	<0.001	259	63.3%	111	65.3%	0.890
Nursing Home	18	7.1%	87	26.8%		76	18.6%	29	17.1%	
Local Parish Council	81	31.9%	23	7.1%		74	18.1%	30	17.6%	

Statistical analysis: t-test and X^2. Age and years of education maintained their significance (age with an increased risk and years of education with a decreased risk).

(p-value=0.026 and p-value <0.001, respectively). This protective effect was only seen in females. Widowers have a higher risk in local parish council (p-value <0.001) and this result was seen only for females (the male sample size was small). Single individuals have higher risk in day center (p-value 0.017), only as a statistical trend in the gender sub-analyses. Doing the same analyses for divorced individuals, there was no statistical difference in any of the places.

Mood assessment

The baseline characteristics associated with being depressed

Table 4. Multivariate analysis

	Referral Criteria		
	Odds Ratio	SE	p-value
Age, years	1.079	0.014	<0.001
Education, years	0.903	0.028	0.001
Place of screen	0.790	0.101	0.065
Marital Status	1.135	0.070	0.040
Single	3.131	0.970	<0.001
Married	0.472	0.117	0.002
Divorced	1.136	0.423	0.732
Widower	0.896	0.187	0.599

Statistical analysis: logistic regression.

as measured by GDS were education, gender and psychiatric history (Table 3). In the multivariate model, all the variables maintained their statistical significance. The multivariate linear regression model presented as an F-Test of 11.02 and a p-value of <0.001.

DISCUSSION

It is important to clarify that the Portuguese health care is a governmental funded system with universal coverage. Care delivery is arranged in health catchment areas according to the World Health Organization principles of primary, secondary and tertiary care. Day center and nursing home are mainly private institutions with only a minority of non-profit non-governmental institutions with government fund. People are admitted to day center and nursing home because of increased difficulties in daily life activities or to avoid severe isolation, and not necessarily for psychiatric or neurological disorders.

When we started to work in the community in the 90's, we found an important clinical informally assessed cognitive decline in this population without adequate referral. Our objective was to find untreated individuals in the community not identified by the current primary health care teams, the treatment gap. We prioritize the place where they would probably benefit more from the intervention. The main effort was to screen day centers. We found 43% of individuals needing further assessment. Local parish councils where the places were individuals less meet the criteria. Regretfully nursing homes were the places where most individuals were screened positive, 51.4%. As we screened only the individuals without current follow-up with psychiatry or neurology, this shows a very high treatment gap. This probably reflects that individuals when admitted to nursing homes or day center, are expected to deteriorate, without the need for further assessment, except if they present severe behavioral disturbances.

When we compare our results with the prevalence result found in 2013 meta-analysis, we found much higher rates of dementia (Western Europe 6.92%) and this is directly related with the place and type of screen.[18] We do not propose to have a population prevalence ratio and we do not generalize our findings to Portugal general population, but these results should inform further strategies regarding elderly individuals and screening strategies.

Day centers represent the crucial and often painful transition. We think this could be one of the transition moments that change how the individuals relate to their family and friends. Day centers should strive to have family interventions and refer all the individuals to further medical assessment. This is a high risk population, they have the higher mean of GDS score and are most at risk to transition to a nursing home. We propose that preventive interventions (primary prevention) should be done in local parish homes and therapeutic interventions (secondary prevention) in day centers and nursing homes. The low follow-through of appointments are the main negative result from our study. Most of the individuals screened positive didn't had a subsequent medical appointment in secondary care teams. This could also reflect the family neglect and acceptance of the deterioration downhill. The generally acceptance of the deterioration path and ignorance of the available treatments and strategies. These results necessarily reflect the absence of general population information regarding dementia.

We are now developing new projects with the primary health care to overcome this difficulty and further studies are needed to identify the barriers and how to overcome them.

From our secondary analysis, we found the known association with an increased risk of being positive in the screening with older age and the lower risk with higher education. Marital status and place of screening had a statistically difference in both cognition and mood assessment. Married individuals were associated with a lower rate of cognitive impairment and single individuals were associated with a higher rate of cognitive impairment. This result is in accordance to other studies.[19] No association was found regarding divorced and widowers.

The place makes an important difference in our study. Comparing individuals in the different places, changes the relations between marital status and cognitive status. For married individuals in day center and local parish council, there was a protective effect only in females. The analyses of single individuals showed that the higher risk is in day centers and that widowers is in local parish council.

These results show that the relationship between marital status and cognition is very complex and further studies are needed to understand it. Probably the quality of the psychosocial network, the relationship with the marital partner and the daily social interactions are more relevant than marital status alone.[20] Also, there could be important differences in the way individuals deal with the loosing of abilities. Widowers could feel more lost in the general community, and feel more protected in a protected environment, such as a day center. Single individuals living in solitude, could be more stressed when forced to share their daily live with strangers. In our opinion, further work should be done to understand the needs of the individual and the best way to support him, adjusting the health care network for their own needs of daily social interactions.

In mood assessment, widowers were associated with a higher score in GDS and being married was associated with a lower GDS score. Marital status showed a significant interaction with place of screen and again, it could be a proxy of the psychosocial network, being certainly a proxy of having a significant other.[21]

Some limitations from our study are the lack of follow-up screenings to this population and a formal diagnosis in the secondary care. We also note that the option to not categorize the previous diagnostic history of the individuals made us loose some information, but this option was made to avoid both diagnostic recall bias and misinformation regarding diagnosis.

Future directions from our research are to find a better way to integrate this individuals in the network of care, enhance the access and support of elderly people to mental health teams, identify the barriers and strategies to overcome them, better collaborate with structures in the community and support and understanding the needs of the relationships between individuals.

CONCLUSION

There was a significant amount of people without a current diagnosis of dementia that filled the criteria of our screening program. This showed the failure of primary care to screen for dementia. Individuals in day centers are at high risk of cognitive impairment and they should clearly be regularly screened.

Marital status was associated with the result of the dementia screening and could be related to the disease. There were complex results in the sub-analyses that suggest further studies of the psychosocial network and daily social interactions.

There is still a lot to be done regarding patients and family education. Stigma regarding cognitive impairment and dementia treatments is associated with low rates of acceptance of the referral. We show a clear need for a proactive and joint intervention of primary and secondary care regarding perceptions, stigma and screening of dementia in Portugal.

CONFLICTS OF INTEREST STATEMENT

No potential conflicts of interest were disclosed.

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