Alzheimer Disease and Associated Disorders
Vol. 16, No. 2, pp. 103–108

Epidemiologic Survey of Dementia in a Community-Dwelling Brazilian Population

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Summary: The authors report the prevalence of dementia in a community-dwelling Brazilian elderly population and correlate prevalence data with educational and socioeconomic levels. The study was conducted in Catanduva, Brazil. A total of 1,656 randomly selected subjects aged 65 years or more were submitted to a health questionnaire, the Mini-Mental State Examination (MMSE), and the Pfeffer Functional Activities Questionnaire (PFAQ). According to the PFAQ and MMSE scores, selected subjects were submitted to clinical, neurologic, and cognitive evaluations. The subjects diagnosed with dementia underwent laboratory tests and brain computed tomography (CT). Dementia was diagnosed in 118 subjects, corresponding to a prevalence of 7.1%. The main clinical diagnoses were Alzheimer disease (AD; 55.1%), vascular dementia (9.3%), and AD with cerebrovascular disease (14.4%). The prevalence increased with age and was higher in women. There was an inverse association with education (3.5% among persons with 8 or more years of schooling to 12.2% among those who were illiterate). Multivariate analysis disclosed significant association between these three variables and dementia. The prevalence of dementia in this Brazilian population was 7.1%, and AD was the most frequent diagnosis. Age, female gender, and low educational level were significantly associated with a higher prevalence of dementia. **Key Words:** Dementia—Alzheimer disease—Epidemiology—Education—Brazil.

Dementia is one of the major health problems of the elderly population, with its prevalence almost doubling every 5 years after age 60 years (Jorm, 1990; Hofman et al., 1991). For this reason, the continuous increase in life expectancy of the world population in the past century is making it an important social problem (Jorm, 1990). Besides age, prevalence of dementia is influenced by other demographic variables, such as schooling and socioeconomic level (Hofman et al., 1991).

In the developing world, including Latin America, a rapid increase in life expectancy has emerged in recent decades. In Brazil, life expectancy has increased since the 1940s, so that persons aged 60 years and older are part of the fastest-growing age group (Ramos et al., 1987). Moreover, developing countries still have a large proportion of people with low levels of schooling, especially among the elderly population.

Few studies on the prevalence of dementia have been conducted in Latin America (Mangone and Arizaga, 1999). In Uruguay, Ketzoian et al. (1997) found a prevalence of 4.03% when considering the entire population of Villa del Cerro, Montevideo. Quiroga (1997) reported in Chile a prevalence of dementia of 5.98% among subjects aged more than 65 years. Llibre et al. (1999) found a prevalence of dementia of 8.2% among subjects aged more than 60 years in Havana, Cuba. In Brazil, previous population studies have focused on the prevalence of organic brain syndrome (Almeida et al., 1984; Blay et al., 1989; Veras and Coutinho, 1991). Although dementia was probably the most frequent cause of the organic

Received December 23, 2000. Accepted March 5, 2002.
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DOI: 10.1097/01.WAD.0000020202.50697.df

brain syndrome, no mention was made of the differential diagnosis with other causes, such as mental retardation or language disturbances.

The goal of the present work was to investigate the prevalence of dementia and the relative frequencies of the diseases causing dementia in a community-dwelling population living in Catanduva, Brazil and to then correlate these data with educational and socioeconomic levels. This report is the first population-based study of dementia in Brazil.

POPULATION AND METHODS

Population

The study was conducted in the urban area of Catanduva, São Paulo state, a city with 100,913 persons according to the 1996 Brazilian census. To determine the relative frequencies of the diseases causing dementia in this community-dwelling population, we calculated that at least 100 patients with dementia should be investigated. Based on a putative prevalence of dementia of 6.0% in those aged 65 years or more, about 1,700 persons would need to be screened. At the beginning of the study, the Brazilian Institute of Geography and Statistics had recently finished a door-to-door census of the city. From this census, we were informed about the domiciles, in each of the city's districts, where persons aged 65 years or more resided and how many lived in each house. According to these data, we estimated that about 6,800 possible subjects lived in 5,153 houses. To investigate 1,700 persons we selected every fourth address from each subdistrict list of addresses, so as to screen 25% of the domiciles. A letter explaining the objective of the study was sent to each selected house, and more explanation about it was provided through local media channels (newspaper, television, and radio).

To know if institutionalization of patients with dementia was a common practice in the community, which would interfere with the prevalence rate, all nursing home residents aged 65 years or more were also included in the survey.

Evaluation

Phase I

After proper training, 20 graduate students from the Catanduva School of Medicine evaluated all elderly subjects living in 25% of the domiciles, at the subjects' homes, and in all nursing homes of the community. Informed consent was obtained from all participants or from a family member, when appropriate. Evaluation consisted of a questionnaire assessing basic demographic data and socioeconomic class [ranging from A (higher) to E (lower), according to the Brazilian Association of the Institute of Market Research], information about the mental status obtained from the subject and from a family member with the Mini-Mental State Examination (MMSE; Folstein et al., 1975), and the Pfeffer Functional Activities Questionnaire (PFAQ; Pfeffer et al., 1982). The PFAQ is one of the questionnaires proposed by two consensus statements on the diagnosis of dementia (Corey-Bloom et al., 1995; Small et al., 1997), and it includes 10 questions about the performance in activities of daily living with scoring ranging from 0 to 3, according to the severity of disability in each activity. The maximum score is 30, and scores higher than 5 indicate functional impairment.

Phase II

All subjects with PFAQ score higher than 5 and MMSE score below specific education-adjusted scores were considered to have suspected dementia and selected for phase II of the study. The MMSE cut-off scores were as follows: 28 for subjects with educational level more than 7 years, 24 for those with 4–7 years of schooling, 23 for those with 1–3 years, and 19 for those who were illiterate. These cut-off scores were higher than those proposed by a Brazilian study (Bertolucci et al., 1994), to increase the sensitivity of the screening. The subjects identified with dementia in the nursing homes were not included in this phase.

Selected subjects were interviewed by a neurologist (E.H.), who obtained a clinical history and performed a general physical and neurologic examination, with emphasis on cognitive testing. For the latter, a second MMSE was performed as were tests of attention (digit span forward and backward), memory of figures (immediate and delayed recall of 10 simple figures; Nitrini et al., 1994), verbal fluency (animals), abstraction (proverb interpretation), calculation, construction (copy of three geometric figures and drawing of a house), clock drawing, tactile gnosis, limb and buccofacial praxis, motor planning (Luria three hand position test), and right-left orientation. The evaluation also included the Hachinski Ischemic Scale (Hachinski et al., 1975) and the Clinical Dementia Rating Scale (CDR, Hughes et al., 1982) for the assessment of severity of dementia.

Subjects with difficulty performing the cognitive tests because of auditory, visual, or other physical problems that could have interfered with their performance and those with insufficient knowledge of the Portuguese language were excluded from the study.

All data obtained in phase II were analyzed by three neurologists (E.H., P.C., and R.N.), and subjects that

fulfilled the Diagnostic and Statistical Manual of Mental Disorders (volume IV; DSM IV) diagnostic criteria for dementia were selected for phase III.

Phase III

In this phase, patients with dementia were submitted to a diagnostic workup that included the following examinations: routine blood tests; tests for liver, kidney, and thyroid functions; cholesterol and triglycerides; serum B12 levels; serology for syphilis; chest radiograph; electroencephalograph (EEG); and computed tomography (CT) of the head.

Based on the data from the clinical history, neurologic examination, and laboratory and CT findings, the clinical diagnoses were made by three neurologists (E.H., P.C., and R.N.) on a consensual basis, according to previously published criteria, namely: National Institute of Neurological Communicative Disorders and Stroke–Alzheimer's Disease and Related Disorders Association (NINCDS-ADRDA) criteria (McKhann et al., 1984) for Alzheimer disease (AD); National Institute of Neurological Disorders and Stroke–Association Internationale pour la Recherche et L'Enseignement en Neurosciences (NINDS-AIREN) criteria (Román et al., 1993) for vascular dementia (VD) and for AD with cerebrovascular disease (AD + CVD); McKeith et al.'s criteria (McKeith et al., 1996) for Lewy body dementia (LBD); and Lund and Manchester criteria (1994) for frontotemporal dementia (FTD).

Statistical Analysis

Statistical analysis was based on contingency tables to evaluate the association between dementia and other quantitative or qualitative variables. The degree of association between the presence or absence of dementia with age, gender, and educational and socioeconomic level was determined by chi-square test for independence between the crossed variables.

Multivariate analysis of dementia prevalence in relation to age, gender, and educational and socioeconomic level was undertaken by logistic regression. The value of significance accepted was 0.05. The software packages Epi-Info 6.0 (Centers of Disease Control and Prevention, Atlanta, Georgia, U.S.A.) and Stata 7 (Stata Corp, College Station, Texas, U.S.A.) were used for the statistical analysis.

RESULTS

Prevalence of Dementia

Nursing Home Residents

There were 62 subjects aged 65 years or older living in nursing home institutions, 28 men and 34 women. Two persons for whom the data were incomplete were excluded from the study. Based on the PFAQ and MMSE education-adjusted, cut-off scores, 39 subjects were selected, with 8 being excluded, having presented severe visual or auditory deficiency. Cognitive deficits and difficulties in activities of daily living compatible with the diagnosis of dementia were observed in 28 of the remaining 31 subjects.

Community-Dwelling Subjects

A total of 1,681 subjects were contacted for the study. From these, 21 (1.2%) were excluded for the following reasons: refusal to participate (9), missing address (9), and death (3). Consequently, 1,660 persons were screened, but 4 were excluded because of severe auditory deficit (1), poor comprehension of Portuguese (1), and absence of an adequate informant (2).

Age and gender distribution of the 1,656 subjects are depicted in Table 1. As for the educational level, 567 (34.2%) subjects were illiterate, 590 (35.6%) had 1–3 years of schooling, 356 (21.5%) had 4–7 years, and 143 (8.6%) had 8 or more years. Illiteracy was more common among women (69.1%). Regarding the socioeconomic level, most of the subjects were classified into classes C (606) and D (631). The majority of the subjects were white (84.5%), with a remaining 9.6% of African descent, 4.3% with mixed ancestry (white, African, and indigenous), and 1.8% of Japanese origin.

Five hundred sixty-eight subjects (34.3%) presented scores below the specific education-adjusted, cut-off scores in the MMSE, with 243 being illiterate, 173 with 1–3 years of schooling, 83 with 4–7 years, and 69 with 8 or more years. As for the PFAQ scores, 307 subjects (18.5%) had scores more than 5, comprising 181 among the illiterate, 76 with 1–3 years of schooling, 38 with 4–7 years, and 12 with 8 or more years.

Considering the MMSE and the PFAQ scores together, 234 subjects were selected for phase II, corresponding to 14.1% of the subjects evaluated in phase I.

From the 234 persons selected from phase I, 220 (94.0%) completed phase II. Fourteen subjects did not participate because of death (8), change of address (5), and refusal to participate (1). One hundred two subjects

TABLE 1. *Age and gender distribution of the 1,656 subjects*

Age group	N (%)	Women (%)	Men (%)
65–69	614 (37.1)	364 (59.3)	250 (40.7)
70–74	470 (28.4)	267 (56.8)	203 (43.2)
75–79	266 (16.1)	158 (59.4)	108 (40.6)
80–84	198 (12.0)	126 (63.6)	72 (36.4)
85–96	108 (6.5)	64 (59.3)	44 (40.7)
Total	1656 (100.0)	979 (59.1)	677 (40.9)

of 220 who were evaluated in this phase were considered to be normal (52) or without clinical evidence of dementia (50). Depression was present in 12 of the subjects.

Based on the consensual evaluation, 119 subjects were diagnosed with dementia. Twenty of these patients presented other concomitant diseases, with depression in 12, B12 deficiency in 6, and hypothyroidism in 2. Appropriate treatment led to improvement of cognitive impairment in two subjects, one with vitamin B12 deficiency and one with depression. This latter case was reclassified as presenting with depressive pseudodementia.

Definite diagnosis of dementia was made in 118 subjects, leading to a prevalence of 7.1% [95% confidence interval (CI), 6.0–8.5%] in this community-dwelling elderly population. When one quarter of the institutionalized persons were included to form the overall prevalence figure (because all nursing homes and only 25% of the domiciles had been investigated), the prevalence increased to 7.5%.

The diagnoses of the dementia syndromes are shown in Table 2. The frequency of VD would have been increased from 9.3% to 14.4% if scores higher than 6 in the Hachinski Ischemic Scale had been considered to indicate VD, whereas the frequency of possible and probable AD (scores below 5) would have increased from 55.1% to 55.9%.

Severity of Dementia

According to the CDR scale, 46 patients were classified as mild (CDR-1), 44 as moderate (CDR-2), and 28 as severe (CDR-3) dementia cases.

Prevalence of Dementia in Relation to Age, Gender, Schooling, and Socioeconomic Level

Prevalence of dementia was considerably higher with increased age (Table 3). Dementia was also more prevalent among women (Table 4) and those who were illiterate (Table 5). Although dementia was more frequent in those in socioeconomic classes C and D, this difference did not attain statistical significance. When the dementias were reclassified as primary degenerative (AD, Parkinson dementia, FTD, and LBD) and secondary dementias (VD or vitamin B12 deficiency), both predominated in classes C and D.

TABLE 2. *Causes of dementia in the 118 cases*

Diagnosis	Number of cases	%
Probable AD	56	47.5%
Possible AD	9	7.6%
Vascular dementia	11	9.3%
AD with CVD	17	14.4%
Parkinson's dementia	4	3.4%
Frontotemporal dementia	3	2.6%
Lewy-body dementia	2	1.7%
Vitamin B12 deficiency	1	0.8%
Undetermined cause	15	12.7%

AD, Alzheimer's disease; AD with CVD, Alzheimer's disease with cerebrovascular disease.

TABLE 3. *Age-specific prevalence of dementia*

Age group	N	Dementia (N)	Dementia (%)
65–69 years	614	10	1.6
70–74 years	470	15	3.2
75–79 years	266	21	7.9
80–84 years	198	30	15.1
85 or more	108	42	38.9

Chi-square = 223.18 (4 degrees of freedom); p = 0.0000

Multivariate Analysis

Logistic regression showed that age ($p = 0.000$), female gender ($p = 0.031$), and low educational level ($p = 0.002$) were associated with a higher prevalence of dementia.

DISCUSSION

In the current study, the prevalence of dementia in this community-dwelling elderly population was 7.1%. If the institutionalized elderly subjects were included, the overall prevalence of dementia in the cohort would increase to 7.5%.

Previous epidemiologic studies on dementia have found prevalence rates ranging from 1.82% in Beijing, China (Li et al., 1989), to 10.8% in a rural community in South Korea (Park and Ha, 1988). In the study conducted in Uruguay, Ketzoian et al. (1997) found a prevalence of 1.8% among persons aged 70–79 years and of 8.7% among those aged 80 years and older. Variations in the prevalence rates may result from differences in the diagnostic criteria used and in data collection methods, to cultural and regional or ethnic differences, and to inclusion or noninclusion of subjects living in institutions. The results of the present investigation are similar to those found by previous studies (Sulkava et al., 1985; Rocca et al., 1990; Lobo et al., 1992; Ueda et al., 1992; Ogura et al., 1995).

TABLE 4. *Prevalence of dementia in relation to gender*

Gender	N	Dementia (N)	Dementia (%)
Male	677	35	5.2
Female	979	83	9.4

Chi-square (Yates corrected) = 6.13; p = 0.0133

TABLE 5. *Prevalence of dementia in relation to educational level*

Schooling	N	Dementia (N)	Dementia (%)
Illiterate	567	69	12.2
1–3 years	590	26	4.4
4–7 years	356	18	5.0
8 or more years	143	5	3.5

Chi-square = 33.54 (3 degrees of freedom); p = 0.0000

In the screening process we used, anyone who achieved a score above the cutoff on the MMSE could not be defined as having dementia. Although this procedure is common in epidemiologic studies on dementia and albeit we have chosen a higher MMSE cut-off score, it may have underrated the prevalence of dementia in this study.

Alzheimer disease was the most frequent cause of dementia in the present cohort, accounting for 55.1% of the cases, followed by AD + CVD (14.4%) and VD (9.3%). The prevalence of VD in our study group may have been higher if we had used other criteria, such as Hachinski Ischemic Scale or DSM-IV, which have high sensitivity but low specificity for the diagnosis of VD. If we had had magnetic resonance imaging (MRI) data, the prevalence of AD + CVD would probably have been higher.

Other degenerative dementias, such as FTD and LBD, that have attracted much interest from investigators in the past decade were not common in the present cohort. This result is probably because, in part, we evaluated only subjects in the senium age group, whereas these other dementias are known to be more prevalent in the presenium age range.

The prevalence of dementia increased with age, ranging from 1.6% in the 65- to 69-year group to 38.9% among those aged 85 years or more. These data are in agreement with many previous studies (Jorm, 1990; Rocca et al., 1990; Hofman et al., 1991). The prevalence of dementia was also significantly higher in women, and this difference was confirmed by multivariate analysis. A factor that may be responsible for this feature is the different survival of men and women with dementia, but this aspect was not addressed in the current study.

Many previous investigations have found an association between low educational level and a higher prevalence of dementia (Jorm, 1990; Rocca et al., 1990; Zhang et al., 1990; Ott et al., 1995). In our cohort, the prevalence of dementia ranged from 3.5% in subjects with 8 or more years of schooling to 12.2% among those who were illiterate. Thus, illiteracy was associated with a significantly higher prevalence of dementia. Given that low educational level is often coupled with low socioeconomic level, plus, in the aged population, with the female gender, we performed multivariate analysis, which confirmed that low educational level was independently associated with a higher prevalence of dementia. This finding could be related to the overdiagnosis of dementia among less-educated persons because they are less able to perform neuropsychologic tests. As we based the diagnosis of dementia not only on these test results but also on decrease in the performance of daily life activities, this explanation seems less likely. It should also be mentioned that for the diagnosis of dementia in this study, we used neuropsychologic tests that can be applied without modification in populations with different educational backgrounds (Nitrini et al., 1994), and we also used education-adjusted, cut-off scores, when available.

Dementia was also more prevalent among subjects from middle-low economic classes, although this finding did not attain statistical significance. In all economic classes, the degenerative dementias were more frequent, thus not confirming the hypothesis that secondary dementias are more prevalent among low socioeconomic classes, which could reflect the reduced access of this population to basic health care (Nitrini et al., 1995).

In conclusion, the prevalence of dementia in this urban community-dwelling elderly population of Brazil was similar to some previous studies, with AD being the most frequent diagnosis. Age, female gender, and low educational level were significantly associated with a higher prevalence of dementia.

Acknowledgments. The authors thank the medical students from the Catanduva School of Medicine for their participation in phase I of the study. The authors also thank Naim Sauaia, Ivaldo Olimpio da Silva, and Dirce Zanetta for their helpful suggestions regarding the statistical analysis. This work was partly supported by FAPESP (Fundo de Amparo à Pesquisa do Estado de São Paulo).

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