Full Length Research Paper

Prevalence of dementia in an elderly illiterate native Mexican population of indigenous origin

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This study aimed to clarify whether or not low level of education may function as a risk factor for dementia among native Mexicans. A door-to-door survey study in an elderly illiterate native Mexican subpopulation of indigenous origin was performed in order to detect prevalence of dementia using both DSM-IV criteria and the Brookdale test. The total village population surveyed included 2226 inhabitants, of which 65 subjects were over 65 years. Dementia, according to DSM IV criteria, was diagnosed in 8 patients above 65 years (9.4% of the target population), while, according to the Brookdale test, it was diagnosed in 5 patients above 65 years (5.9% of the target population). We found a higher prevalence of dementia according to DSM-IV in patients above 65 years (9.4%) in our study subpopulation, which may support the assumption that low education as well as age may contribute to a higher prevalence of dementia.

Key words: Dementia, Brookdale test, DSM-IV, illiteracy.

INTRODUCTION

Dementia, of which Alzheimer's disease is the most common cause, affects about 5% of the elderly population over age 65 years (Ritchie and Lovestone, 2002). While a complete understanding of Alzheimer disease (AD) remains elusive, five risk factors for the illness are firmly established: increasing age, the presence of the apolipoprotein E-epsilon 4 allele, familial aggregation, Down's syndrome and head injury (McDowell, 2001). Other associations have been suggested including gender with females generally appearing to be at higher risk than males (McDowell, 2001).

While a full understanding of the etiopathology of dementia remains unknown, some have suggested that education may provide a reserve of brain capacity that would compensate for brain structural changes with age (e.g. parenchymal atrophy, white matter perfusional decline). This is known as the "brain reserve hypothesis" and it has been proposed that it must be depleted to a certain threshold before dementia is clinically manifested (Coffey et al., 1999). Low level of education as a risk factor for the development of dementia remains a controversial subject, which demands further investigation (Liu et al., 2002; Salemi et al., 2002; Cobb et al., 1995; Munoz et al., 2000; Bowirrat et al., 2001). In order to further clarify whether low level of education may function as a risk factor for dementia we investigated the prevalence of dementia in an illiterate native Mexican subpopulation of indigenous origin.

PATIENTS AND METHODS

The community

A community-based investigation was performed, by means of a

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door-to-door population survey, in order to detect prevalence of dementia in rural native indigenous Mexican population aged 65 years and older. A small village named "Epigmenio Gonzalez" was selected for this purpose as it is characterized by very low-income, high rate of poverty and illiteracy and scarce contact with any Western civilization. The main income of the community is from agriculture and sporadic low level employment in nearby areas. "Epigmenio Gonzalez" belongs to the state of Queretaro, which is situated 60 km from its capital, the city of Queretaro. The native indigenous population in that region belongs to the native indigenous original tribe "Otomis". The principal language of the community is Spanish and "Otomi". However, all the population surveyed spoke in Spanish.

Study sample

An institutional review board acknowledged by the Mexican Ministry of Health approved the study; written informed consent was not required due to the naturalistic nature of the study and they only required oral informed consent from the patient and family. Medical records of target population were obtained from the local health medical archives in Pedro Escobedo village responsible for the regional social service which is the last year program of medical school in Mexico. All subjects and their families voluntarily consented to participate in the study. In order to detect and access all inhabitants aged 60 years and older, 4 high school students who lived in the region performed a door-to-door survey of approximately one-month duration from January to February 1998. Information collected following this initial survey included age, sex, and location of all inhabitants. The individuals who performed the survey provided no medical information about the responding inhabitants. All inhabitants detected in the census aged 65 years and older were candidates for the study.

Assessments

An experienced physician in the evaluation of dementia (R.S) who was performing his social service in the village as the last year program of medical school coordinated, surveyed and evaluated the target population accompanied by 2 medical students who performed the initial survey and who were well acquainted with the area. The physician interviewed and examined every subject of the over 65 year's age group. Full explanation of the nature of the study was given to all subjects and their family members and approval was obtained from both the cohort and the family before screening. Educational and medical history, alcohol and drug habits were obtained before cognitive, physical and neurological examinations were performed. Included were all subjects aged more than 60 years old who were living by the time of the door-to-door survey in the village. Excluded were subjects engaged in any psychoactive drug or alcohol abuse including any alcohol or drug intoxication during the interview, history of severe head trauma, mental retardation and severe mental illness such as psychotic disorder.

In order to screen for dementia all subjects were assessed by the Brookdale test for dementia (Davies, 1987), which was translated into Spanish (and back into English for quality control). The Brookdale test is a general cognitive measurement instrument considered appropriate for an illiterate population and includes 13 questions. The items include questions regarding orientation to time and place, general performance, identification of objects by palpation, naming of 10 fruits, identification of common attributes of objects, number repetition (the rater reads numbers out aloud and the subject is asked to repeat them by memory), right/left identification, picture reproduction and short term memory. Two

points are given for a complete response and 1 point for an incomplete response with a maximum total score possible of 26 points. Subjects under a cut-off point score of 9 out of a maximum score of 26 points on the Brookdale test were diagnosed as demented (Kahana et al., 1992). In addition, all subjects were interviewed in order to screen for dementia and major depression (MD) according to the criteria of the diagnostic and statistical manual of mental disorders-fourth edition (DSM-IV) (American Psychiatric Association, 1994).

Thus, all subjects who met the following three criteria were considered as suffering from dementia and were included in the final statistical analysis:

1. A minimum score of 9 or less out of a maximum score of 26 points on the Brookdale test with no diagnosis of Dementia according to DSM-IV criteria.
2. Subjects who fulfilled DSM-IV criteria for dementia and scored above 9 points on the Brookdale test.
3. Subjects who met both DSM-IV criteria for dementia and score point of 9 points or less on the Brookdale test.

Considering that dementia may also occur in Parkinson's disease patients, motor features were also examined. For a diagnosis of Parkinsonism to be made, two of the following signs had to have been present: rigidity, bradykinesia, rest tremor and/or postural instability with the additional requirement that the subject not be taking any medication that could have caused Parkinsonism (e.g. antipsychotic medication).

Statistical analysis

Association between variables was performed using the chi-square and t-test, as appropriate according to variables nature. A two significant level of $\alpha = 0.05$ was applied in all tests.

RESULTS

The total village population surveyed included 2226 inhabitants, out of which 65 subjects aged 65 and older were detected as described earlier (2.9% of total population). All of these eligible subjects were aged 65 years or older and were illiterate. One eligible candidate for the study refused to participate, and 3 were not located on follow-up. Of the 65 subjects who entered the study 37 were female (56.9%) and 28 were male. The average age was 73.3 ± 7.7 (mean ± SD). Of the 65 subjects 6 (9.2%) suffered from diabetes mellitus type II, 11 (16.9%) suffered from hypertension, 2 (3.1%) suffered from both hypertension and diabetes mellitus type II, 1 (1.5%) suffered from chronic obstructive pulmonary disease, and 1 (1.5%) suffered from symptomatic cardiac heart failure. Furthermore, 1 subject (1.5%) reported a prior cerebral vascular accident. Dementia according to DSM IV criteria was diagnosed in 8 patients (12.3% of target population; mean age 84.5 ± 9.7). Of these 8 patients, one patient (12.5%) suffered from hypertension, one patient suffered from chronic obstructive pulmonary disease (12.5%) and one patient (12.5%) presented signs of Parkinsonism and fulfilled DSM-IV criteria for dementia related to Parkinson's disease. The neurological and

physical examinations of the remaining 5 patients were negative for any signs of illness.

Dementia (Table 1) according to the Brookdale test was diagnosed in 6 patients (7.7% of the target population; mean age 82.2 ± 11.6). One patient (16.6%) suffered from hypertension and one patient suffered from cerebral vascular accident (16.6%), was hemiplegic and fulfilled DSM-IV criteria for vascular dementia. In the overall group the mean age for non-demented subjects according to the Brookdale test was 72.2 ± 6.9 and 71.8 ± 5.9 years for non-demented subjects according to DSM-IV criteria. These results indicate that age was significantly higher in subjects diagnosed with dementia according to both criteria (t = 2.84, df = 63, P > 0.01; t = 5.23, df = 63, P < 0.001, respectively). No associations were found between both criteria of dementia and gender. According to the DSM-IV 10.8% of male and 14.3% of female met the diagnostic criteria of dementia. According to the Brookdale test 8.1% of male and 7.1% of females were demented.

An association between the categorized Brookdale (0 to 9, 10+) and DSM-IV diagnosis of dementia was performed using chi-square test of independence. The result indicated a significant association between the variables (x^2 = 23.0, df = 1, P = 0.001). Most of the subjects (n = 56, 86.9%) were non-demented according to both DSM-IV and Brookdale test. However, the association among diagnosed subjects was low: an agreement between definitions was on 4 subjects (44.4% of the diagnosed subjects); dementia according to DSM-IV but not according to Brookdale test was seen in 4 subjects; and dementia according to Brookdale test but not according to DSM-IV was seen in one subject. The association between Brookdale test (raw score) and DSM-IV criteria for dementia was performed using t-test. Subjects with non-dementia according to DSM-IV had higher Brookdale scores compared to diagnosed subjects (positive for dementia according to DSM-IV: 8.9 ± 6.3 Brookdale scores compared to diagnosed subjects (positive for dementia according to DSM-IV: 8.9 ± 6.3 Brookdale score, range 0 to 17, negative for dementia according to DSM-IV 15.7 ± 3.7 Brookdale score, range 6 to 23; t = 4.34, df = 63, P < 0.001). This result indicates that DSM-IV criteria dissociate two subpopulations of Brookdale scores, but there was still high degree of overlap between the sub-populations.

Fifteen subjects (23%) met DSM-IV criteria for major depression. No association was found between major depression and both DSM-IV (P = 0.45) or Brookdale criteria for dementia (P = 0.20). No significant association was found between major depression and age (P = 0.29) or gender (P = 0.14).

DISCUSSION

The present study is, to our knowledge, the first community survey investigating the prevalence of dementia in an illiterate Mexican indigenous population with difficult accessibility and the first to correlate both DSM-IV and Brookdale test for dementia. Results indicated the overall prevalence for dementia to be 12.3% in subjects above 65 years when DSM-IV criteria for dementia was used, and 7.7 % when the Brookdale test was performed. When both tests were applied the prevalence of dementia was 6.1% (4 subjects) for subjects above 65 years.

While the study findings are certainly interesting, several limitations should be noted. First, while the Brookdale test has been validated in a predominantly illiterate population (11), members of the target population for the validation were living at the time in a developed country and thus were in continuous contact with Western civilization, This is in contrast to the population of our study, which was in limited contact with Western civilization, and it may be possible that the Brookdale scale is different in different populations. Second, the sample may be too small in order to draw any firm conclusions regarding the prevalence of dementia in such a population. Third, the study was performed in an isolated area in which laboratory tests and facilities were not accessible, a fact that limits the diagnostic range of the type of dementia that in this population was based only on physical examination and medical history. It thus remains possible that in part the higher prevalence of dementia was due not only to illiteracy but also to environmental factors such as vitamin deficiencies and other nutrients which are related to the low level of education. Fourth, other confounding factors such as major depression and its relationship with dementia require clarification and may have served as a potential confound in diagnosis despite all efforts to exclude them. It should be noted that the Hamilton depression rating scale was not performed since it has not been validated in illiterate indigenous population and may have served as a further potential confounding factor for the assessment of major depression in this kind of population. Thus although there was no statistical correlation between depression and dementia, it still remains possible that DSM-IV criteria for major depression may not detect all subjects with depression, since somatization is an important manifestation of major depression in this type of population and not necessary depressed mood. Fifth, although we obtained no reports of alcohol or substance abuse we cannot exclude unreported cases, which given the nature of such epidemiological study should be always taken into account as a potential confounding factor.

The study of the epidemiology of dementia in developing countries, in which the prevalence and incidence of dementia may be influenced by low level of education, requires specialized instruments and personnel. Thus while cultural and sub-cultural

Table 1. Presence or absence of dementia according to diagnosis by DSM-IV criteria and brookdale classification.

Brookdale diagnosis of dementia	DSM IV diagnosis of dementia	
	Present	Absent
Present	4	1
Absent	4	56

differences between various populations are highly relevant to the design of such studies, it is widely recognized that illiteracy pose considerable challenges to the reliable and valid cognitive screening of any specific subpopulation. This study reflects the difficulty and limitations such a survey imposes when it comes to determine the prevalence of dementia in an isolated region regarding this type of population with no access to medical laboratories and facilities. Considering the level of an individual's education as a risk factor for dementia it is important to consider its prevention since a variety of educational programs at various stages in an individual's life may be implemented in order to reduce this "treatable" risk factor. While it may be tempting to hypothesize a reduction in the prevalence of dementia as a result of a progress of education related to "brain reserve hypothesis"(Coffey et al., 1999), the complexity and variety of the actually known etiopathophysiological factors for dementia strongly warns against hastily speculations.

CONCLUSION

We found a higher prevalence of dementia according to DSM-IV in patients above 65 years (12.3%) in our study compared to educated subjects in other studies (Ritchie and Lovestone, 2002). The considerable literature supporting low level of education as a contributing factor for the development of dementia and AD is in concordance with our findings (Liu et al., 2002; Salemi et al., 2002; Cobb et al., 1995; Munoz et al., 2000; Bowirrat et al., 2001). It would however be important to extend the findings of this preliminary pilot study to the investigation of similar illiterate populations but with a larger sample number and with some access to laboratory facilities in order to confirm type and potential reversibility of any dementia detected. Although preliminary, studies emphasizing education as a risk factor for dementia in this population subtype with difficult accessibility are however of value in that they provide information regarding potentially "treatable" risk factor of this disease. Further studies including access to a larger study sample for investigation of this type of population in developing countries is mandated in order to support these findings.

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