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Alzheimer's disease through the "10 warning signs" approach

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Abstract

Objective : To assess the validity of the "10 Warning Signs" in identifying AD in the population.

Methods : A cross-sectional study was undertaken in which 3038 consenting elderly >60 years old of both sexes (1790 urban and 1248 rural) in Egypt were screened for the presence of any of the 10-Warning Signs (possible AD) recommended by the Alzheimer's Association. They were assessed for cognitive impairment (AD) by Mini-mental State Examination. The results obtained by the screening for warning signs were compared with the presence of AD as evidenced by the presence of cognitive impairment.

Results : The prevalence of possible AD in the study population was 19.7%, and that of AD was 8.8%. Possible AD was observed to be significantly higher in rural residents, females, increasing age, the unmarried, illiterate, those not working and the poor. The possibility of AD being present increased with the number of warning signs. The "10-Warning Signs" screening test had 100% sensitivity and 88.1% specificity, false positives 11.9%, false negatives 0%, predictive value of a positive test 44.9% and that of a negative test 100%.

Conclusion : The "10-Warning Signs" approach is likely to identify all those suffering from AD, and can be a very useful tool for population-based screening for AD in the elderly at the grass-root level.

Key Words: Alzheimer's Disease, warning signs, population-based screening, Mini-mental State Examination.

INTRODUCTION

With increasing longevity and rapidly aging populations in the developing countries, Alzheimer's Disease (AD) is likely to become a public health problem among the elderly in India. Consistent alertness to "triggers" or warning signs and brief cognitive screening with a standardized measure to recognize early dementia in at risk elderly is recommended in primary care practice.[1]

Dementia is a clinical diagnosis which relies upon an experienced clinician's assessment.[2] Mini-Mental State Examination (MMSE),[3] is the most widely used instrument for assessing cognitive functions both in clinical settings and in research. It best assesses disorders with important language and memory components, such as AD.[4]

The Alzheimer's Association lists "10 Warning Signs of AD",[5] the presence of any of the signs should lead to medical referral. AD has largely been neglected by researchers in India, and the few studies have focused mainly on the prevalence and risk factors. We could not find any studies related to early recognition of AD at community level. The present study was carried out to assess the validity of the "10 Warning Signs of AD" as a population based screening tool by primary level health providers, to identify AD, compared to the standard assessment by MMSE confirmed by a physician/neurologist.

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OBJECTIVES

To assess the validity of the "10 Warning Signs of AD" as a population based screening tool at the grass-root level to identify AD in the population under study.

MATERIALS AND METHODS

Study design

Cross sectional.

Study period

1st June – 30th November, 2011.

Population under study

Residents of the field practice areas of the Department of Community Medicine, Zagazig University

Egypt, which comprised of about 45,000 population. The respondents were consenting elderly (>60 years old) of both sexes. Due to lack of information on the prevalence of Alzheimer's disease in this population, all the residents in the eligible age-group in the study population were included in the investigation.

Consenting procedure and data collection:

Institutional Ethics Committee approval for conducting the study was obtained prior to commencement. The interview was conducted in the language with which the subject was familiar (Hindi/Punjabi). Informed consent was obtained from the respondents and from the care-giver in the event of the subject being unable to give informed consent. Information was obtained from using a pre-tested questionnaire containing various socio-demographic parameters. The subjects were screened for the presence of the 10 warning signs of AD by primary level health care providers, that is, Multi-purpose Health Workers [5]. The Mini-Mental Scale Examination (MMSE),[3] was applied to assess cognitive functioning, and confirmed by the neurologist investigator. Both the instruments were translated into Hindi and Punjabi and back translated into English by professional translators to ensure the validity and integrity of the translation.

Exclusion criteria

The deaf/dumb, those with diagnosed psychiatric illness (schizophrenia, mental retardation), with neurological disorders (Parkinsonism, severe head injury or brain neoplasm), were excluded since there was no way to obtain reliable information from them. The blind and those who were ill at the time of the study were also excluded.

Operational defining criteria

1. Subjects were classified as "Possible Alzheimer's Disease" if they had any one or more of the 10 warning signs of Alzheimer's disease.
2. Those with MMSE score $\leq$25 were considered as "cognitively impaired", and *classified as having AD.*[3]

RESULTS

A total of 3054 eligible elderly were found in the population under study, of which 16 met the exclusion criteria or were sick at the time of the study and hence excluded. Data for 3038 respondents is presented.

Table-1 : 597 (19.7%) of the respondents had one or more warning signs of AD ("possible AD"). Possible AD was observed to be significantly higher in rural residents, females, increasing age, the unmarried, illiterate, those not working and the poor.

Table-2 shows the presence of warning signs of AD in relation to the presence of AD as identified by MMSE. 8.8% respondents were identified to have AD as evidenced by the presence of cognitive impairment (MMSE score $\leq$25). None of the respondents with no warning signs were found to have AD. 33.4% of those with 1-3 signs, 94.0% of those with 4-6 signs and 100% of those with 7 signs or more present were found to have AD. The differences were statistically highly significant (p=0.0000).

Table-3 shows the evaluation of the population-based screening for possible AD by the "10-Warning Signs" in comparison with the clinical diagnosis of AD by the presence of cognitive impairment. The screening method was found to have 100% sensitivity and 88.1% specificity. The predictive value of a positive test was 44.9%, and that of a negative test was 100%.

Table-2 : Presence of Warning Signs and Alzheimer's Disease

No. of Warning Signs	Alzheimer's Disease Present	Absent	Total
0	0 (-) (-)	2441 (100) (88.1)	2441 (80.3)
1-3	163 (33.4) (60.8)	325 (66.6) (11.7)	488 (16.1)
4-6	63 (94.0) (23.5)	4 (6.0) (0.1)	67 (2.2)
7-9	18 (100) (6.7)	0 (-) (-)	18 (0.6)
All 10	24 (100) (9.0)	0 (-) (-)	24 (0.8)
Total	268 (8.8) (100)	2770 (91.2) (100)	3038 (100) (100)

X^2=1641.62, df=4, p=0.0000

DISCUSSION

Given the time needed for mental status testing and clinical interview of patient and informant, community physicians understandably fail to diagnose dementia in over 50% of cases, particularly in the earlier mild to moderate stages. However, both the American Medical Association and American Academy of Family Physicians recommend that physicians be alert for cognitive and functional decline in elderly patients and for recognition of early stage dementia.[6]

An early diagnosis for AD is crucial because the earlier the treatment, the better the chance of a favorable response to treatment, the longer the delay of progressive symptoms and the lesser the financial cost. In addition, early treatment along with good caregiver support can

Table-1 : Distribution of Possible Alzheimer's Disease in the Study Population

Variable	Possible Alzheimer's Disease		Total (n = 3038)	p-value
	Yes (n =597)	No (n = 441)		
Residence				
Rural	354 (28.4)	894 (71.6)	1248	0.0000
Urban	254 (13.6)	1547(86.4)	1790	
Sex				
Female	363 (22.0)	1291 (78.0)	1654	0.0005
Male	234 (19.9)	1150 (83.1)	1384	
Age (yrs)				
61-65	238 (15.2)	1328 (84.8)	1566	0.0000
66-70	147 (20.4)	573 (79.6)	720	
71-75	78 (21.2)	289 (78.8)	367	
76-80	46 (26.6)	127 (73.4)	173	
>80	88 (41.5)	124 (58.5)	212	
Marital Status				
Married	364 (17.9)	1671 (82.1)	2035	0.0019
Unmarried	7 (28.0)	18 (72.0)	25	
Widowed	226 (23.1)	752 (76.9)	978	
Type of Family				
Nuclear	70 (18.7)	304 (81.3)	374	0.6272
Joint	527 (19.8)	2137 (80.2)	2664	
Education				
Illiterate	389 (27.4)	1031 (72.6)	1420	0.0000
Primary School	60 (11.6)	459 (88.4)	519	
Middle School	80 (12.7)	548 (87.3)	628	
High School	53 (15.4)	290 (84.6)	343	
College/more	15 (11.7)	113 (88.3)	128	
Occupation				
Not working	544 (22.1)	1915 (77.9)	2459	0.0000
Working	53 (9.1)	526 (90.9)	579	
Monthly Per Capita Income (Rs.)				
Upto 1000	185 (29.1)	451 (70.9)	636	0.0000
1001-2000	203 (18.5)	892 (81.5)	1095	
2001-3000	95 (16.0)	497 (84.0)	592	
>3000	114 (15.9)	601 (84.1)	715	
Source of Income				
Dependent on Family	393 (20.6)	1516 (79.4)	1909	0.0915
Independent income	204 (18.1)	925 (81.9)	1129	

Figures in brackets indicate percentages

have a considerable effect on maintaining a patient's current level of functioning, thus maximizing the quality of life for both the patient with AD and his family,[7] Moreover, the average annual rate of change is estimated to be 3.3 MMSE points (95% CI 2.9 – 3.7).[8] However, the early symptoms of AD in the elderly are considered by family members as a normal part of the aging process, and not identified as a disease which could benefit by early diagnosis and treatment. Families may be uncertain and concerned if a loved one has the symptoms of AD. The warning signs may help them decide if an evaluation is warranted: the presence of any of the listed signs should lead to medical referral.

The prevalence of possible AD in the present study, based on 10 warning signs was 19.7%. In a study

Table-3 : Evaluation of Alzheimer Association's "10-Warning Signs of AD" as a Population-based Screening Test for AD

Alzheimer Association's 10-Warning Signs	Alzheimer's Disease Diagnosed by Cognitive Impairment		Total
	Present	Absent	
Positive	268	329	597
Negative	0	2441	2441
Total	268	2770	3038

False positives : 11.9%
False negatives : 0%
Sensitivity : 100%
Specificity : 88.1%
Predictive value of a positive test : 44.9%
Predictive value of a negative test : 100%

carried out by Sengupta et al in Uttarakhand [9] using the same criteria and in the same age-group, the prevalence of possible AD was found to be 10.0%.

A significantly higher prevalence of possible AD was found in the rural population in this study (p< 0.0000). Shaji et al[10] in a study in Kerala also reported a higher prevalence of Alzheimer's Disease in the rural population. Differences in lifestyle, health awareness and healthcare delivery systems may be the factors contributing to this difference. A significant female preponderance of possible AD (p=0.0005) was found in our study. A higher prevalence of AD in females has also been reported by other researchers [9-12]. The prevalence of possible AD was found to be significantly higher with increasing age, which is also in agreement with the findings of other researchers [10,11,13]. Widowed/unmarried status was also observed to be a highly significant risk factor for possible AD.

Illiteracy and poverty were also identified as highly significant risk factors for the likelihood of the disease in the study population, with the prevalence of possible AD being higher among the illiterates and in the poorest. The Rotterdam study,[11] also reported that the two lowest educational levels were associated with increased relative risks of AD. A lower educational level has been a consistently reported risk factor for AD and dementia, with the risk of AD and dementia decreasing with increasing education [14] Plassman et al ,[12] also observed people with fewer years of education to be at higher risk of Alzheimer's than the more educated.

The prevalence of possible AD was higher among the unemployed (22.1%) as compared to those working (9.1%), and the difference was statistically highly significant (p=0.0000). This finding is in agreement with that of Alvarado-Esquivel *et al* [15] .

The prevalence of AD, based on MMSE scores < 25 was found to be 8.8% in the present study. The possibility of AD being present increased with the number of warning signs : all those with 7 or more signs were found to have AD. Evaluation of the population-based screening for possible AD by the "10-Warning Signs" in comparison with the clinical diagnosis of AD by the presence of cognitive impairment showed that the screening method had 100% sensitivity and 88.1% specificity, with predictive value of a positive test being 44.9% and that of a negative test 100%. The screening test is likely to identify all those suffering from AD, and can be a very useful tool in the hands of grass-root level primary health care providers in the community for population-based screening for AD in the elderly.

CONCLUSIONS

Our study shows the prevalence of possible AD in the >60 years old population under study to be 19.7% and that of AD as 8.8%. Those living in a rural area, female sex, increasing age, the unmarried/widowed, unemployed, illiteracy, and poverty were found to be significant risk factors for the disease. Our study also shows that the "10-Warning Signs of AD" as recommended by the Alzheimer's Association, with high sensitivity (100%) and specificity (88.1%), can be a useful screening test for AD in elderly populations. Primary health care providers and family members of the elderly need to be aware and alert to the presence and identification of the warning signs to facilitate early diagnosis.

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