Application of Standard Screening Test Tools For Preliminary Detection of Alzheimer's Disease

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Abstract:

Population aging is a powerful and transforming demographic force occurring in almost all countries of the world. It has given rise to host of medical conditions like Alzheimer's diseases (AD) and different types of dementia .Objective of this exploratory study was to assess the usefulness of screening tools as facilitator for preliminary detection of AD. Eighty two subjects of different age groups from 21 to 60 years and above were randomly selected. Identification of cognition status for preliminary detection of AD was carried out by use of standard screening test tools viz. Brief screening, Montreal Cognitive Assessment (MoCA) and Mini-Mental State Examination (MMSE) in the consecutive manner. The results of Brief screening test tool showed normal cognition status for age group 21 to 60 and 82.35% subjects of 60 and above were found to have mild cognitive impairment (MCI). In the MoCA test, 100 % subjects of age group 21 to 50 showed normal cognition status .7.14 % subjects of age group 51 to 60 and 79.41% subjects of age group 60 and above showed mild cognitive impairment. In MMSE, 100 % subjects of age group 21 to 30 showed normal cognition status whereas, highest percent of subjects i.e. 94.12 % with significant mild cognitive impairment was observed in age group of 61 and above. Findings of the current study indicated that age group of 60 and above seems to have mild cognitive impairment which may increases the risk of (AD).It's early detection can be helpful to prevent the later progressing to dementia .Therefore, application of these accessible, time-efficient and cost effective screening tools might be helpful to facilitate the pre detection of AD for avoiding the disabilities in late life as well as to minimize the future burden of Alzheimer's disease.

Keywords: *Dementia, Alzheimer's disease(AD), Brief screening tool, MoCA, MCI, MMSE*

I. INTRODUCTION

Population aging is a powerful and transforming demographic force. Due to the decreasing mortality and declining fertility it is found in almost all the countries of the world. The global share of older people (60 years or above) increased from 9.2 percent in 1990 to 11.7 percent in 2013 and will continue to grow as a proportion of the world population, reaching 21.1 percent by 2050.Globally, the number of older persons are expected to more than 2 billion in 2050.[1].

The ageing of the population has given rise to host of medical conditions including different types of dementia. The prevalence of dementia increases significantly from the age of 65 years and doubling every five years thereafter [2]. Alzheimer's disease (AD) is the most commonly occurring and widely-studied form of dementia. Although, AD is present in individuals from the age of 65 years, it may occasionally occur earlier in patients as young as 45 years old.[3]. The most commonly found symptoms in AD are memory impairment, loss of topographic orientation, personality changes and language disturbances. [4-5]. It is found that symptoms of AD can start appearing a bit earlier and often ignored as age-related changes or stress disorders. This disease has been estimated to affect anywhere between 25 to 50 million people worldwide, though its prevalence is believed to be increasing due to changing lifestyle habits and exposure to environmental hazards.

Unfortunately, majority of disease-modifying experimental interventions for AD have failed to demonstrate clinical benefits in the individuals with symptomatic AD. The most likely explanation for the failure delay in the drugs administration during the course of the AD neuro-pathological processes.[6]. It is likely to assume that these therapies will be more effective when applied before major brain damage has occurred which makes the identification of biomarkers sensitive to preclinical or early clinical stages of AD crucial.[7].

The current state-of-the-art, clinical diagnosis of AD requires a specialty clinic including medical examination, neuropsychological testing, neuroimaging, cere brospinal fluid (CSF) analysis and blood examination which are time consuming and expensive. Moreover, for these rapidly aging global population with an expected dramatic increase of AD cases, there are insufficient numbers of specialty clinics to meet the growing needs. It is reported that that non-specialist clinicians are mistaken at identifying early AD and mild cognitive impairment (MCI), which is a major impetus to the search for clinically-usefulscreening and diagnostic tools. Thus, there is an increasing need for additional non-invasiveand/or cost-effective tools, allowing front line identification of subjects in the preclinical or early clinical stages of AD. [6][8].

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It is reported that questionnaire of brief screening tool can be used to find out the cognition status of the subject. Whereas, Mini-mental State Examination (MMSE) is appreciated as the best tool for ruling out a diagnosis of dementia in the community and primary care.[9]. In which the scores ranges from zero to thirty points where, scores less than 24 points are suggestive of dementia.[10-12].The sensitivity of MMSE to detect early AD and, in particular, MCI cases is inadequate.[9]. Numerous studies showed that the Montreal Cognitive Assessment (MoCA) is superior to Mini-Mental State Exam (MMSE) while screening for mild cognitive impairment or dementia in patients with Alzheimer or Parkinson disease. [13-14]. Increasing doubts on the applicability of MMSE for MCI screening resulted in the preparation of alternative tools like the MoCA test.[15] , which is a cognitive screening test with a high level of reliability and internal consistency for detection of dementia [16-18].

Therefore, application of these accessible, time-efficient and cost effective screening tools may be helpful to facilitate early pre detection of AD for avoiding the disabilities in late life.

II. MATERIAL AND METHODS

Sampling and Screening Measures

Eighty two subjects (individuals) of different age groups 21 to 60 years and above were randomly selected in Yr.2015. Identification of cognition status for preliminary detection of Alzheimer's disease was carried out by use of standard screening test tools viz. Brief screening, Mini-mental State Examination (MMSE), Montreal Cognitive Assessment (MoCA)in consecutive manner which takes approximately 10-15 minutes each to complete. Memory identification was carried out with the help of questionnaire of brief screening tool. Score below 27& 26 was used to establish cognitive impairment with MMSE and MoCA respectively. Individuals who were illiterate, aphasic, and dysphasic or who had severe visual or hearing limitations were excluded for these standard screening tests

Brief Screening Tool

Questionnaire of brief screening tool was used to find out cognition status of the subject. Memory identification was carried out by discussion with the subject and caregiver/friend/family members.

Mini -Mental State Examination (MMSE)

The MMSE, which depends on the impairment of the individual required was easily administered within 5- 10 minutes. To carry out this test, 30 items were grouped into five categories viz. orientation, registration, attention and calculation, recall and language. The test was divided into two sections . The first section included verbal responses to orientation, memory and attention questions and the second section was comprised of naming, reading and writing and the ability to follow verbal and written commands, sentence writing and copying a polygon [12].

Montreal Cognitive Assessment (MoCA)

MoCA testwas a one-page test with a maximum of 30 points and eight cognitive domains with 10items .It was included with different tests on short-term memory, visuo spatial skills, executive function, phonemic verbal fluency, abstraction, attention, concentration and working memory, language function, and time orientation [20]. Visuo spatial abilities were assessed by use of clock drawing task and copying a three dimensional cube. Executive functions were assessed using an alternation task drawing a line from a number to a letter in ascending order. Naming was assessed using three animals (lion, rhinoceros and camel). By repeating a list of digits in forward and backwards order, a target detection task, as well as a serial subtraction task, attention abilities were evaluated. Language was assessed through repetition of two syntactically complex sentences and a fluency task. Abstraction was evaluated using similarity task. Finally, orientation to time and place was evaluated.

III. RESULTS AND DISCUSSION

Cognition Status By Different Screening Test Tools

The results of Brief screening test tool showed that cognition status was normal for age group 21 to 60 but 82.35% of subjects above the age 60 were found to have mild cognitive impairment. Results of MMSE indicated that 100 % subjects showed normal cognition status for age group 21 to 30. Significant mild cognitive impairment was observed from age group of 31 to 60 and above in which highest percent of subjects i.e. 94.12 % were belonging to age group 61 and above.

During the MoCA test 100 % subjects showed normal cognition status for age group 21 to 50, whereas 7.14 % subjects of age group 51 to 60 and 79.41% subjects of age group 60 and above showed mild cognitive impairment.(Table.1)

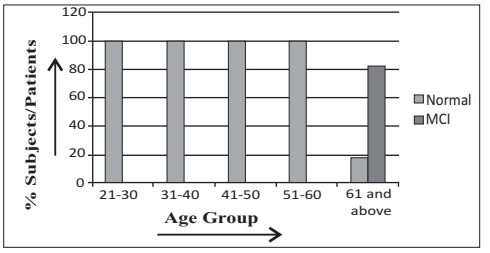
Table.1. Cognition status by different Screening Test Tools

Age Group	% Subjects by different Screening Measures					
	Brief Screening		MMSE		MoCA	
	Normal	MCI	Normal	MCI	Normal	MCI
21-30	100	0	100	0	100	0
31-40	100	0	69.23	30.77	100	0
41-50	100	0	75	25	100	0
51-60	100	0	71.42	28.57	92.86	7.14
61 and above	17.65	82.35	5.88	94.12	20.59	79.41

(*MMSE- Mini- Mental State Examination, MoCA -Montreal Cognitive Assessment ,MCI-Mild Cognitive Impairment)

Brief Screening Test Tool

Results of Brief Screening test showed that the cognition status was normal for age group 21 to 60.Whereas for the age group 61and above, 82.35 % subjects were found to have mild cognitive impairment (MCI) which can be a preliminary indicator of Alzheimer Diseases and Dementia.**(Fig.1)**

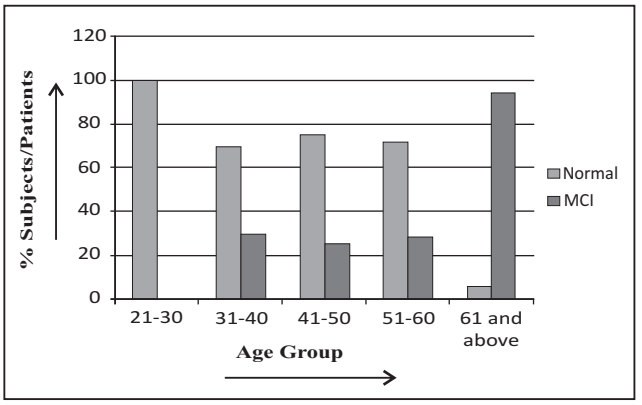


(*MCI: Mild Cognitive Impairment)

Fig 1. Cognition Status by Brief Screening Tool

The Mini- Mental State Examination (MMSE)

It was found that for age group 21 to 30,the cognition status was 100 % normal. It was found that 30.77 % subjects of age group 31 to 40 had mild cognitive impairment and age group 41 to 50 showed 25 % subjects with mild cognitive impairment while for age group of 51 to 60 , 28.57 % subjects were found to have mild cognitive impairment whereas, 94.12 % subjects of age group61 and above showed mild cognitive impairment indicating the possibility of Alzheimer Diseases and Dementia.**(Fig.2)**

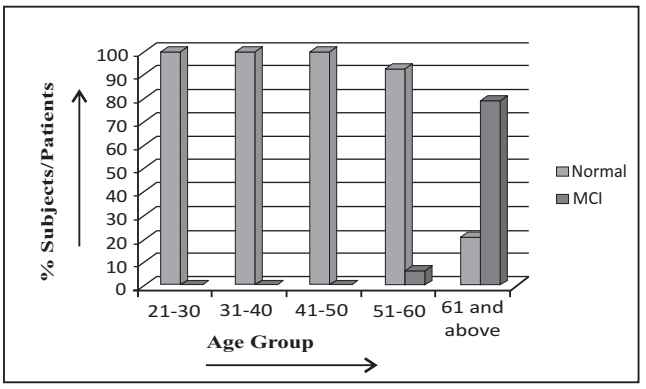


(*MCI: Mild Cognitive Impairment)

Fig.2.Cognition Status by Mini- Mental State Examination (MMSE)

Montreal Cognitive Assessment (MoCA)

During MoCA test, it was observed that cognition status was 100 % normal for age group 21 to 50 whereas in the age group 51 to 60, 7.14 % subjects were found to have mild cognitive impairment while,79.41% subjects between age group 61 and above showed mild cognitive impairment indicating possibility of Alzheimer Diseases and Dementia.**(Fig.3)**



(*MCI: Mild Cognitive Impairment)

Fig.3.Cognition Status by MoCA

IV. CONCLUSION

In this exploratory study, identification of cognition status was carried out by use of different standard screening test tools. In Brief screening test tool,82.35% of subjects of age group 60 and above were found to have mild cognitive impairment. MoCA test indicated that 79.41% subjects of age group 60 and above showed mild cognitive impairment. Where as in MMSE, age group of 61 and above showed the highest percentage of mild cognitive impairment i.e. 94.12 % . Findings of the current study indicated that age group of 60 and above seems to have mild cognitive impairment which may increase the risk of later progressing to dementia, caused by Alzheimer's disease. Therefore, application of these accessible, time-efficient and cost effective screening tools may be helpful to facilitate early pre detection of AD for avoiding the disabilities in late life as well as to minimize the future burden of Alzheimer's disease.

V. ACKNOWLEDGMENT

The authors are grateful to Dr D. Naik, Principal, NVP's Arts, Commerce and Science College, Lasalgaon as well as Dr. Santosh Gupta, Physician, Manmad and Dr. Anand Patil, Psychiatrist, Nashik for kind support and guidance. We acknowledge Mr. P. Gangele, Rahat Sanstha, Manmad for providing necessary facilities for the experiment setup. We are highly thankful to our research mentor, Mr. D. V. Handore, Nashik for valuable assistance and scientific inputs.

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