

Cognitive impairment and its consequences in activities of daily living (ADL) in people with Dementia of Alzheimer's type (DAT)

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Abstract: Dementia of Alzheimer's type is a progressive neurodegenerative disorder characterized by problems in performing daily living activities (ADL). Researchers further suggested that Basic ADL got impaired in severe stage of DAT and IADL found impaired in mild stage of DAT patient. Moreover, mild DAT patients have problem in dealing with that require focusing and maintaining attention (vigilance). The present study purports to correlate the scores obtained on different cognitive domains with activities of daily living. Hindi version of Mini-Mental State Examination (HMSE) and Everyday Abilities Scale for India (EASI) were administered on patient diagnosed with DAT. Pearson product moment correlation coefficient was calculated between EASI and HMSE scores. The result showed that attentional domain of HMSE was found most predictive of EASI followed by visuospatial, language and delayed recall among all cognitive domains. In sum, the present study suggests that if the MCI and mild DAT patients get training on attentional task such as attentional network task (ANT) that would improve their activities of daily living performance.

Keywords: attention, activities of daily living, Alzheimer, EASI, HMSE.

I. INTRODUCTION

Dementia of Alzheimer's type is characterised as a progressive neurodegenerative condition characterized by progressive cognitive deterioration in cognitive domains like memory, attention, visuospatial ability, language etc. As dementia is a global term which encompasses several type of neurodegenerative condition, which can be distinguished on the basis of their core clinical features. In specifying dementia, a symptom of behavioural changes defines frontotemporal dementia whereas Lewy body dementia is characterized by hallucination type symptoms. Further, the other dementia, such as vascular type marked by post stroke or multi infarct dementia, whereas motor control deficit is the feature of Parkinson's dementia. Among all, the dementia of Alzheimer's type is the only neurodegenerative disorder which severely affects the cognitive abilities of a person, unlike in other dementia where domains other than cognition have been impaired. Thus, it revealed that cognitive deficit has been the core feature of people with DAT.

The neurobiological aspects of deterioration in cognition is due to the deposition of plaques and tangles that affects cognitive processing in DAT. Although, the first symptomatic feature seen is the deterioration in recalling activities, however the process of neurodegeneration has been started 20 years prior to the onset of actual symptom. The presymptomatic phase of DAT can be examined as deterioration in attentional function in the mild cognitive stage of

disease which is explained by theories relating the processes of attention and memory. The other cognitive deficit in DAT includes language disturbances at early stage of disease. The disturbances in language mainly occurs at pragmatic and syntactic level. The processing difficulties on pragmatic level is due to the deficit in executive and working memory process and on syntactic level the deterioration in working memory resulted in difficulties in naming objects.

The cognitive deterioration in DAT affects the ability to perform everyday life activities. The dysfunctional cognitive abilities like memory, executive functions and attention have been shown to correlate with impaired functional status of a person [1]. The memory impairment in DAT can be figured out in activities related with eating, taking medicines etc., i.e. particularly at the level of episodic memory. Executive function deficit has been an important predictor of ADL deficit in patients with DAT. The impaired executive function causes deterioration in problems in dressing, making, sequencing and organizing plans for family, remembering tasks to be done etc. The attention deficit in DAT impaired the activities of daily living (ADL) related to misplacing things like keeping keys in fridge and vegetables in cupboard, locating places like toilet bathroom, route to home. These activities have a higher demand for cognitive functions than basic ADL and are important for living an independent life.

Previous researches have shown that cognitive deterioration affects the activity of daily living in patients with DAT. Several studies have been conducted on relationship ADLs and cognitive domains viz. attention, memory, visuospatial function, executive function. Further, a study examined the relationship between cognitive functioning and ADL in 202 patients with mild DAT. The ADL rating was taken from the caregivers. The result showed that attention was the best predictor of total ADL score and predicted bathing and eating like abilities [2]. The performance of attentional impairment on Repeated Battery for the Assessment of Neuropsychological Status (RBANS) and ADL on 66 patients of different dementia indicated that RBANS status, specifically attention, visuospatial and immediate memory indices correlated strongly with the scores of ADL [3]. A recent study on evaluating relationship between cognitive functioning and activities of daily living and suggest that self-report, caregiver report, performance based measures of ADL could be useful in clinical setting and helps in enhancing independence in self-care activities in demented patients to improve their quality of life and thus alleviating the burden on caregiver [4].

Although for neurocognitive assessment there are enormous number of measures are accessible, however in a clinical setting, administering these tests have been proved to be a skill based and time demanding task. Thus, several comprehensive neurocognitive measures like Mini-Mental State Examination (MMSE), Alzheimer's Disease Assessment Scale- Cognitive subscale (ADAS Cog), Montreal Cognitive Assessment (MoCA), Addenbrook's Cognitive Examination (ACE) have been extensively utilized in past studies. The pool of neurocognitive test measure have different specificities and sensitivities. Among all, MMSE is the most extensively used tool and an efficient neurocognitive measure to assess the cognitive functioning. Although MMSE has been proved to be the unsurpassed neuroscreening test, however in India due to language and culture diversity a need of hindi version test was needed. An Indo-US Cross-National Dementia Epidemiology Study in Ballabgarh (New Delhi) and Pennsylvania (USA) [5] constructed a hindi version of MMSE and effectively modified the test to make it culturally sensitive so that it can utilize all the cognitive domains. It has been now widely used to assess the cognitive impairment in elderly. The reported sensitivity and specificity of HMSE were 81.3% and 60.2% respectively.

The assessment of dysfunction in activity of daily living due to cognitive deterioration has been the major concern in people with DAT in India. The assessment of ADL and IADL by Lawton Scale of ADL (Lawton, Brody, 1969) [6] is not appropriate to use in India, as it has certain items which is not applicable for elderly in Indian setting. Hence, a scale called Everyday Assessment for India (EASI) [7] found to be the most appropriate for ADL assessment in elderly. As previous studies suggested a correlation between the scores of a neurocognitive measure and a scale which measures ADL, hence we could predict the progression of the cognitive impairment using HMSE in terms of ability to perform activity of daily living in patients using EASI. The correlation helps in predicting people with mild cognitively impaired to progress Alzheimer type dementia in later course of illness in outpatient settings.

In developing country like India, there is burden on clinician as the ratio between doctor and patient is differed so much that a clinician is unable to give appropriate time to the patient. In this regard if we can correlate the subscores of HMSE and EASI than we can predict the impairment in ADL from the performance of cognitive tests. The assessment of activities of daily living would help in rehabilitation approach as to when and how to intervene. Previously, the studies have assessed the correlation between HMSE and EASI however, they have not measure the in depth analysis between the

subscales of HMSE like attention, orientation, language, memory, comprehension, visuospatial ability etc. and EASI subscores. The present study examined the correlation between the sub scores of cognitive performance and activities of daily living (ADL) function. The study also assessed the cognitive domain which has been considered as the most predictive of impairment in activity of daily living.

II. METHODOLOGY

Participants

The present study consisted of 25 diagnosed DAT patients out of which 13 participants were mild DAT patients, 6 were moderate DAT and 6 were severe DAT patients. The age criteria for the study was 55 years or above. Consent of the participants as well as patients' caregivers was obtained. Three centers were selected for collecting data viz. Department of Neurology, S.S. Hospital, B.H.U, Varanasi, Department of Geriatrics Mental Health, King George's Medical University, Lucknow, and the Institute of Communicative and Cognitive Neurosciences, Shoranur, Kerala.

Tools

Hindi-Mini Mental State Examination (HMSE) and Everyday Abilities Scale for India (EASI) were administered on patient diagnosed with DAT.

Hindi Mini-Mental State Examination (HMSE)

Hindi Mini- mental State Examination (HMSE) developed by Ganguli et.al. (1995) [5] was used as a neurocognitive measure for the study. The HMSE consisted of 23 items which measures global cognitive functions related to orientation to time, orientation to place, registration of words, attention, recall, naming, repetition, visual command, three step task, sentence, copying a figure. Broadly, it measures cognitive domain of word list learning, recall and recognition, object naming, verbal fluency and constructional praxis. The cut off score for screening DAT patient was ≤ 19 for participant with education (up to 5 years) and < 25 for 6 years or more of education.

Everyday Abilities Scale for India (EASI)

The activities of daily living were measured by Everyday Abilities Scale for India (EASI) developed by Fillenbaum, Chandra, Ganguli, et al, (1999) [7]. The EASI comprised of 12- item brief measure of activities of daily living and it is appropriate for evaluating activity of daily living in dementia among elderly in India. The items in scale included the abilities related with eating, locating toilet area, soiled cloth, button cloths, dress cloth, work in team, opinionate about family, completing a given task, remembering festivals, delivering message, understanding events and locating village. It is a two point scale. Respondents have to answer whether he/ she can (assigned as 1) or can not (assigned as 0) perform the activity of daily living. Thus, the respondents who receive higher score on EASI indicate greater disability.

Procedure

Diagnosed patients of DAT were taken from the outpatient department. Data were collected through questionnaire. Initial screening of DAT patient and healthy control was done by using Hindi Mental State Examination. The patients and caregivers were instructed about the questionnaire. Rapport was established and then consent and biographical information was taken. The cognitive functioning of patients were assessed using HMSE and their ability to perform everyday activities were also examined using EASI, through caregivers interview session.

III. RESULTS

The scores on HMSE scale in the present study showed a marked impairment in cognitive functioning of patients with DAT. The cognitive functioning was analysed on scores obtained on HMSE. The activity of daily living was assessed by EASI. The demographic characteristic of patients in terms of age and education were recorded. The cognitive functioning of patients with DAT was analysed in respect of age and education. The severity of illness was included as clinical information of patients. The EASI scores as given scale responded by the caregivers also revealed the difficulties faced by patients in their daily activity. Among all the 25 DAT patients, 13 were mildly, 9 were moderately, 3 were severely demented patients with DAT. Further, the analysis of variance was performed to examine the interaction effect if any between EASI and HMSE scores as per their severity levels. The obtained scores on HMSE and EASI were analysed on different variables and the means, SDs and analysis of variance for different stages of DAT are displayed in table 1.

TABLE I: MEANS, SDS AND ANALYSIS OF VARIANCE FOR DIFFERENT STAGES OF DAT

Variable	N	Mean	SD	F	P
HMSE					
Mild	13	19.76	0.43	204.65	0.001
Moderate	9	17.22	0.66		
Severe	3	13.00	0.50		
EASI					
Mild	13	5.30	2.25	3.56	0.046
Moderate	9	3.33	1.58		
Severe	3	2.66	2.30		

The analysis of variance revealed significant difference in the cognitive functioning of mild, moderate and severe patients assessed by HMSE, $F(2, 22) = 204.65, p = 0.001$. Patients with mild DAT performed better as compared to moderate and severe stage on neuropsychological measure.

Further, analysis of variance showed a significant difference in the performance of activities of daily living obtained on EASI score in group with different severity levels, $F(2, 22) = 3.56, p = 0.046$. Patients with severe DAT exhibited more difficulty in performing activity of daily living as compared to moderate and mild DAT.

The scores of HMSE and EASI on patients with different level of education were analysed and results displayed in table 2.

TABLE II: MEANS, SDS AND ANALYSIS OF VARIANCE FOR EDUCATIONAL QUALIFICATION

Education	N	M	SD	F	P
HMSE					
Less than high school	3	14.66	2.88	4.14	0.010
High school	4	16.50	2.88		
Intermediate	6	18.500	1.37		
Graduate	6	18.33	1.21		
Post graduate	5	19.80	0.44		
Doctoral	1	20.00	2.27		
EASI					
Less than high school	3	2.00	2.00	4.07	0.011
High school	4	4.25	1.25		
Intermediate	6	3.16	2.63		
Graduate	6	4.00	1.26		
Post graduate	5	6.80	0.83		
Doctoral	1	7.00			

The obtained result on analysis of variance showed that DAT patients in respect of education differ significantly on cognitive performance, $F(5,19) = 4.14, p = 0.010$. Patients with more than intermediate education performed better as compared to patients with less than intermediate of education. Similarly, analysis of variance result revealed that ability to perform activity of daily living in terms of education of DAT patients differ significantly, $F(5,19) = 4.07, p = 0.011$. The patients who have education less than high school have more difficulty in performing daily activity as compared to patients who have more than high school of education.

The cognitive functioning of patients were further analysed on different age range of patients. The obtained mean, SDs, analysis of variance results are presented in Table 3.

TABLE III: MEAN, SDS AND ANALYSIS OF VARIANCE FOR DIFFERENT AGE GROUPS

Variable	N	M	SD	F	P
HMSE					
55-64 years	12	19.66	0.49	1.72	0.19
65-74 years	9	17.66	1.00		
75-84 years	2	14.50	2.12		
85+ years	2	13.00	0.00		
EASI					
55-64 years	12	5.08	2.19	50.23	0.001
65-74 years	9	3.55	2.06		
75-84 years	2	5.00	1.41		
85+ years	2	2.00	2.82		

A non-significant difference in cognitive performance among different age group was obtained, $F(3,21)= 1.72$, $p=0.19$ which could be due to the difference in age onset of the symptoms. However, in evaluating the scores of EASI, a significant difference in executing activity of daily living among different age group was found, $F(3,21)= 50.23$, $p=0.001$. Further, DAT patients of age group 55-64 years performed better on activity of daily living in comparison to other remaining group size.

Correlational analysis

The relationship between the scores of HMSE and EASI were calculated by computing the correlation between HMSE and EASI. Pearson product moment correlation was used to analyse the relation between EASI, HMSE and other variables. The obtained Pearson correlation and its significance values are displayed in Table 5.

TABLE IV: CORRELATIONAL ANALYSIS OF AGE, EDUCATION AND SEVERITY AGAINST THE SCORES OF HMSE AND EASI

	Age		Education		Severity	
	r	P	r	P	r	P
HMSE	-0.93	0.001	0.416	0.038	-0.95	0.001
EASI	-0.34	0.089	0.35	0.08	-0.47	0.016

The correlation between the scores of HMSE and EASI were computed which showed a significant positive correlation, ($r= 0.46$, $p= 0.019$). The result suggest that people who had better cognitive performance, performed better in activities of daily living. The Pearson product moment correlation also showed that there was a significant positive correlation between education and cognitive performance, ($r=0.416$, $p=0.038$). However age ($r= -0.93$, $p=0.001$) and level of severity were negatively ($r=-0.95$, $p=0.001$) associated with the cognitive performance of DAT patients. Further, the correlation between the score of EASI and severity of illness revealed negatively associated with severity of illness ($r=-0.47$, $p= 0.016$). However, age ($r=-0.34$, $p=0.089$), education ($r=0.35$, $p=0.089$) were not significantly associated with the activity of daily living.

Regression analysis

The relationship between the sub score of EASI and HMSE were analyzed using multiple regression analysis. The beta, R, R2, analysis of variance are displayed in Table 6.

TABLE V: BETA, R, R², AND ANALYSIS OF VARIANCE OF SCORES ON NEUROCOGNITIVE AND FUNCTIONAL SCALE DATA

Predictors	Forget to eat	Toilet location	Soils cloth	Cloth button	Dress properly	Team work	Family opinion	Complete task	Remember festivals	Delivered message	Understanding events	Locate village
Orientation to time	.09	-.52	.14	-.90	-.51	-.51	-.67	-.67	-.54	-.27	-.34	-.29
Orientation to place	.47	1.26	.15	.32	.26	.26	.39	.39	.50	.21	.17	.93
Registration	-.34	-.33	.28	.08	.13	.13	.07	.07	-.18	-.13	.23	-.21
Attention & Concen.	.46	.03	-.25	.49	.20	.20	.10	.10	-.41	.07	.12	.29
Recall	.20	.35	-.17	.14	-.08	-.08	.31	.31	.89	.08	-.04	.04
Naming	.15	.06	.14	.34	.25	.25	.21	.21	-.09	-.02	.41	.14
Reading	-.39	-.67	.12	-.44	-.20	-.20	-.25	-.25	-.09	-.17	.03	-.63
Language	-.33	-.32	-.21	-.80	.34	.34	-1.56	-1.56	-.25	.71	-.47	-.06
Comprehension	-.25	-.28	.88	-.40	-.26	-.26	-.43	-.43	-.35	-.04	.58	-.12
Writing	.30	.93	-.01	1.42	.19	.19	1.35	1.30	.81	.32	.46	.38
Constru. Praxis	-.12	.03	-.15	.43	.62	.62	.37	.37	.21	.22	-.19	-.24
R	0.94	0.91	0.95	0.92	0.86	0.84	0.86	0.97	8.29	0.94	0.90	0.96
R ²	0.88	0.83	0.92	0.86	0.74	0.72	0.75	0.94	0.68	0.89	0.82	0.92
F	9.47	6.02	13.70	7.45	7.45	3.03	3.54	19.71	2.59	10.13	5.46	14.80

A multiple regression was carried out to investigate whether subscores of HMSE could significantly predict patient's activities of daily living related with forgets to eat. The results of the regression indicated the model explained 88.9% of the variance and that the model was a significant predictor of forgets to eat, $F(11, 13) = 9.47, p = 0.001$. The cognitive domain of orientation to place ($\beta=0.47, p=0.032$), registration ($\beta=-0.34, p=0.051$), attention and concentration ($\beta=0.46, p=0.003$) and comprehension ($\beta=-0.25, p=0.051$), contributed significantly to this model. Further, in predicting the ADL related with finding the location of toilet explained 83.6 % of the variance and the model was a significant predictor, $F(11,13) = 6.029, p = 0.002$. The orientation to place ($\beta= 1.26, p= 0.00$) and reading ($\beta=-0.67, p=0.011$) contributed significantly to the model.

Similar analysis was also conducted in predicting patients activity of daily living related with soils cloth activity with HMSE score. The results of the regression indicated that the model explained 92.1 % of the variance and that the model was a significant predictor of ADL of soils cloth, $F(11,13) = 13.70, p=0.001$. The comprehension ($\beta= 0.88, p=0.00$) cognitive domain of HMSE significantly predicted soils cloth followed by attention and concentration ($\beta=-0.25, p= 0.00$).

Furthermore, multiple regression in predicting patients activity of daily living related button cloths activity of daily living indicated that the model explained 86.3 % of the variance and that the model was a significant predictor of ADL of button cloths, $F(11,13) = 7.45, p= 0.001$.

The orientation to time domain of HMSE ($\beta =0.49, p=0.003$) were the cognitive domain significantly predictive of EASI domain of button cloths followed by constructional praxis ($\beta= 0.43, p=0.22$), naming ($\beta = 0.34, p=0.028$), and comprehension ($\beta =-0.40, p=0.008$).

In predicting patients activity of daily living related dress properly, the multiple regression analysis further indicated that the model explained 74.9 % of the variance and that the model was a significant predictor of the ADL related to dress properly, $F(11,13) =7.45, p= 0.017$. Among the cognitive domain, the constructional praxis ($\beta=0.62, p= 0.016$)

contributed significantly to the model. The results of the regression in predicting patients activity of daily living related team work variable activity of daily living indicated that the model explained 72 % of the variance and that the model was a significant predictor of activity related with team work, $F(11,13) = 3.03, p = 0.030$. The constructional praxis was the single cognitive domain ($\beta = 0.62, p = 0.016$) predicted significantly to the activity of daily living related to team work.

Multiple regression in predicting patients activity of daily living related family opinion activity of daily living revealed that the model explained 75 % of the variance and was a significant predictor of family opinion ADL, $F(11,13) = 3.54, p = 0.017$. The cognitive domain related writing ($\beta = 1.35, p = 0.024$), language ($\beta = -1.56, p = 0.006$), and comprehension ($\beta = -0.43, p = 0.028$) contributed significantly to the model. Further, multiple regression in predicting patient's activity of daily living related to completing a given task indicated that the model explained 94.3 % of the variance and model was a significant predictor completing task, $F(11,13) = 19.71, p = 0.001$. The comprehension ($\beta = 0.87, p = 0.00$) was the cognitive domain significantly predictive of EASI domain of completing task followed by orientation to place ($\beta = 0.39, p = 0.017$), attention and concentration ($\beta = -0.19, p = 0.051$) and language ($\beta = -0.54, p = 0.032$).

The activity of daily living related with remembering festivals was predicted and the results of the regression analysis indicated that the model explained 68.7 % of the variance and the model was a significant predictor of remembered festivals, $F(11,13) = 2.59, p = 0.53$. The cognitive domain of attention and concentration ($\beta = 0.89, p = 0.006$) was the most predictive among all the cognitive domain followed by orientation to time ($\beta = 0.54, p = 0.05$). The results in predicting patients activity of daily living related with predicting delivering a message indicated that the model was a significant predictor and explained 89 % of the variance, $F(11,13) = 10.13, p = 0.001$. Language was the single cognitive domain, ($\beta = 0.71, p = 0.037$) predicted significantly to the ADL related with delivering a message.

Further, the ability related to understanding events in daily activities was predicted and the results of the regression indicated that the model explained 82.2 % of the variance and the model was a significant predictor of understanding event ADL, $F(11,13) = 5.46, p = 0.003$. The cognitive domain of comprehension ($\beta = 0.58, p = 0.002$) and naming ($\beta = 0.41, p = 0.021$) contributed significantly to the model. Furthermore, patients activity of daily living related to locating village was predicted and the results of the regression indicated that model explained 92.6 % of the variance and the model was a significant predictor of the ADL of understanding event, $F(11,13) = 5.46, p = 0.001$. The orientation to place ($\beta = 0.93, p = 0.00$) significantly predicted the model followed by attention and concentration ($\beta = -0.63, p = 0.001$) and constructional praxis ($\beta = -0.24, p = 0.04$).

IV. DISCUSSION

The purpose of the present study was to assess the relationship between the several neurocognitive domains with various activities of daily living. The neurocognitive domain was examined by using HMSE and EASI. The study revealed that there are several factors which contribute in cognitive deficit in patients with DAT. The most important factor found to be the age of patients. In this light, an additional analysis were conducted to assess the difference in cognitive impairment with regard to age group and found no age related significant difference in cognitive impairment which could be due to the educational differences among the groups. However, the present study also found that the functional impairment in DAT differ significantly in different age group as the problem faced in activities of daily living differ in different age group. Further, in relating the age of patients and cognitive performance the study revealed that as patient's age progresses, a decline in cognitive performance has been found. This finding was consistent with a previous study which revealed a significant correlation between the scores on HMSE and age. Further, among the other variables, the educational attainment brings a new concept of cognitive reserve which played a crucial role in cognitive function [8]. The cognitive reserve not only increase with education but also with social activities, life experiences, occupation etc. Consistent with the recent findings of education as a strong correlation with HMSE [9], the present study also showed that DAT patient with lower level of education are cognitively more impaired as compared to high level of education.

The study further found that another factor related to cognitive impairment is the stage of illness. As DAT is a progressive disorder which starts with the preclinical to mild and further to moderate and severe stage, therefore, the stage wise differences in cognitive performance was the obvious finding of the present study. Initially, milder stage DAT patients have difficulty in performing instrumental ADL, like buying things from market, handling finances, food preparation, etc. however, at severe stage of illness, patients lose the ability to perform basic ADL revealed by the present study.

The present study also corroborate the findings of a study that found association between EASI and HMSE [10]. The study also examined the predictive value of sub scores of HMSE to predict individual functional domains of EASI. The regression analysis model revealed that among all the neurocognitive domain of HMSE, attention and concentration, orientation, comprehension were found to be the significant. The attentional functioning contributed to the predictor of most of ADL skills such as forget to eat, cloths buttons, dress properly, family opinion and locate village. Similarly, a study on a stepwise regression analyses found that among the subscores of MMSE, orientation, language, attention and recall were the strong predictor of most of the functional domains on Direct Assessment of Functional Status (DAFS) [11]. The obtained results also demonstrated that it was possible to predict everyday functional activity in dementia patients from their performance on certain HMSE sub-scores. This present study also suggests that attentional dysfunction might be one of the primary cognitive factors associated with functional impairment in patient with DAT.

A practical implication of the study is to use a test of attention in diagnosing cognitive impairment in patients with DAT. The effect of impaired attention may be mediated by the known attentional requirement of wide range of cognitive process. As the nature of Alzheimer's disease has been progressive and unfortunately, the degeneration cannot be reversed. However, therapies and early interventions only can delay the progression of motor and cognitive effects of dementia and provide to make these daily activities easier, or at least more do-able. Thus, a person's quality of life may improve by prolonging that person's independence, and by making them feel that they are productive.

V. CONCLUSION

The analysis revealed that correlation was mild to moderate such that lower HMSE scores were associated with higher level of functional impairment in ADL. The study also revealed that the demographic variables like age, education and stage of illness also played a significant role in cognitive functioning in patients with DAT. The result of correlational analysis revealed attention and concentration domain of HMSE to be the most predictive of EASI's sub scores followed by orientation and comprehension. In sum, the present study suggests that HMSE is not only a neurocognitive screening tool may also helps in predicting functional impairment in patients with DAT.

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DECLARATION OF INTEREST STATEMENT

No

ETHICAL CLEARANCE

The study protocol was approved by University Ethics committee and written informed consent was taken from all the participants and caregivers before the study.

REFERENCES

- [1] Marshall GA, Rentz DM, Frey MT, Locascio JJ, Johnson KA, Sperling RA, Alzheimer's Disease Neuroimaging Initiative. Executive function and instrumental activities of daily living in mild cognitive impairment and Alzheimer's disease. *Alzheimer's & Dementia*. 2011 May 1; 7(3):300-8.
- [2] Hall JR, Vo HT, Johnson LA, Barber RC, O'Bryant SE. The link between cognitive measures and ADLs and IADL functioning in mild Alzheimer's: what has gender got to do with it?. *International Journal of Alzheimer's Disease*. 2011; 2011.
- [3] Freilich BM, Hyer LA. Relation of the Repeatable Battery for Assessment of Neuropsychological Status to measures of daily functioning in dementia. *Psychological Reports*. 2007 Aug; 101(1):119-29.
- [4] Mlinac ME, Feng MC. Assessment of activities of daily living, self-care, and independence. *Archives of Clinical Neuropsychology*. 2016 Sep 1; 31(6):506-16.
- [5] Ganguli M, Ratcliff G, Chandra V, Sharma S, Gilby J, Pandav R, Belle S, Ryan C, Baker C, Seaberg E, Dekosky S. A Hindi version of the MMSE: the development of a cognitive screening instrument for a largely illiterate rural elderly population in India. *International Journal of Geriatric Psychiatry*. 1995 May; 10(5):367-77.

- [6] Lawton MP, Brody EM. Instrumental activities of daily living scale (IADL). *The Gerontologist*. 1969; 9: 179-86.
- [7] Fillenbaum GG, Chandra V, Ganguli M, Pandav R, Gilby JE, Seaberg EC, Belle S, Baker C, Echement DA, Nath LM. Development of an activities of daily living scale to screen for dementia in an illiterate rural older population in India. *Age and Ageing*. 1999 Mar 1; 28(2):161-8.
- [8] Gambhir IS, Khurana V, Kishore D, Sinha AK, Mohapatra SC. A clinico-epidemiological study of cognitive function status of community-dwelling elderly. *Indian journal of psychiatry*. 2014 Oct; 56(4):365.
- [9] O'Bryant SE, Humphreys JD, Smith GE, Ivnik RJ, Graff-Radford NR, Petersen RC, Lucas JA. Detecting dementia with the Mini-Mental State Examination. *Arch Neurol*. 2008; 65: 963-7.
- [10] Raina SK, Chander V, Prasher CL, Raina S. Prevalence of hypertension in a tribal land locked population at high altitude. *Scientifica*. 2016; 2016.
- [11] Razani J, Wong JT, Dafaeeboini N, Edwards-Lee T, Lu P, Alessi C, Josephson K. Predicting everyday functional abilities of dementia patients with the Mini-Mental State Examination. *Journal of geriatric psychiatry and neurology*. 2009 Mar; 22(1):62-70.