A PROSPECTIVE OBSERVATIONAL STUDY OF MINI-MENTAL STATE EXAMINATION IN ELDERLY PARTICIPANTS ATTENDING OUTPATIENT CLINIC IN GERIATRIC DEPARTMENT, MADRAS MEDICAL COLLEGE, CHENNAI

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ABSTRACT

BACKGROUND

The Mini-Mental State Examination (MMSE) or Folstein test is a 30-point questionnaire that is used extensively in clinical and research settings to measure cognitive impairment. It is commonly used in medicine and allied health to screen for dementia. It is also used to estimate the severity and progression of cognitive impairment and to follow the course of cognitive changes in an individual over time; thus making it an effective way to document an individual's response to treatment. The MMSE's purpose has been not, on its own, to provide a diagnosis for any particular disease.

The aim of the study is to observe the cognitive status of elderly patients attending Geriatric Outpatient clinic, Rajiv Gandhi Government General Hospital, Madras Medical College, Chennai using Folstein's Mini-Mental State Examination and study the same with respect to Gender and Education.

MATERIALS AND METHODS

Design- A hospital-based, prospective, observational study.

109 elderly patients were selected and Mini-mental State Examination (MMSE) was done. The Sample size was selected for convenience. Co-existing morbid conditions were also recorded.

RESULTS

In MMSE performance among elderly-

1. Out of 109 participants 68 participants had scored 25 and above, 29 participants had scores between 24 and 19 suggesting mild cognitive impairment and 12 had scores ≤ 18 suggesting severe cognitive impairment.
2. There was no statistical difference between the two genders. ($p > 0.05$).
3. Literates fared better than illiterates ($p < 0.05$).

CONCLUSION

The validity of the MMSE should be considered with caution and confirmed with other relevant tests to assess cognitive function in the elderly population.

KEYWORDS

Mini-Mental Status Examination, Geriatric, Dementia, Elderly.

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BACKGROUND

Cognition is the ability to interact meaningfully to one's environment.⁽¹⁾ There are many domains in cognition like attention, memory, language, visuospatial skills and executive functioning, each served by different parts of brain. Cognitive impairment increases with age.⁽²⁾ In normal ageing the cognitive domains are affected in the following ways:

Attention- Sustained and primary attention span is preserved while there is impairment of divided attention.

Executive Function- There is difficulty in learning novel executive tasks.

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Memory

Remote memory, procedural memory and semantic call are all preserved while there is impairment in learning and recall of new memory.

Language

Comprehension, vocabulary and syntactic abilities are preserved while spontaneous word finding and verbal fluency is impaired.

There is slowness in information processing and reaction time.

Cognitive impairment is a spectrum which proceeds from that of Normal ageing, to Minimal Cognitive Impairment (MCI) which can be subjective and then becomes objective but without affecting the functional status and then progressing to Dementia. Precipitous decline can occur with some illness and drugs.⁽³⁾

But even though there is age-related impairment in cognition across multiple domains in healthy ageing, it is adequate to be functionally independent.⁽⁴⁾

Cognitive impairment is universally screened using Mini-mental State Examination (MMSE).⁽⁵⁾ There are many other tools to screen cognition but MMSE is widely used and simple

and easy to apply. MMSE briefly assesses all the following cognitive domains:

Domain	Maximum Points
Attention	5
Orientation to time	5
Orientation to place	5
Registration	3
Recall	3
Naming	2
Reading	1
Writing	1
Repetition	1
3 Stage command	3
Copying	1
Maximum Total points	30

It has a maximum score of 30. A cut-off below 24 is mild cognitive impairment and below 18 is severe cognitive impairment.⁽¹⁾ But MMSE has its limitations. It is found to vary with culture, education and language. It has a “Ceiling effect” – even though cognitively impaired, highly educated individuals score high and “Floor effect” - cognitively intact individuals who are illiterate score low.⁽⁶⁾ Normal tests reduce the probability of Dementia and abnormal tests increase the likelihood of Dementia but in itself MMSE score is not diagnostic in confirming or ruling out Dementia.⁽⁷⁾

There are many impediments in assessing cognitive status in elderly.⁽⁸⁾ Sensory impairments such as vision and hearing impairment will make it difficult for elderly to perform the tasks. There is age-related psychomotor slowing and so it takes a longer time for an old individual to complete a task than his younger counterpart. Many comorbid conditions which are found increasingly in elderly like Diabetes, Hypertension, Hypothyroidism, Depression, Nutritional deficiency affects cognition. Stroke and Parkinson's disease which are diseases of elderly causes cognitive impairment. Essential tremor of ageing may impair the ability to draw and write. Polypharmacy is common among elderly. Drugs both prescribed and over-the-counter affect cognition.

“Delirium” or “Acute Confusional State” is one among the “Geriatric Giants” of clinical presentations.⁽⁶⁾ Elderly people with any underlying disease may present with the clouded consciousness. Unless the baseline functional status is already known it is difficult to assess the cognitive status of the elderly who is seen in emergency department in delirious state. Also cognitive impairment may go unrecognised in elderly and may be unmasked by illness such as infection or metabolic disturbances.⁽⁷⁾ So baseline screening of cognition is all the more important in elderly. Comprehensive Geriatric Assessment includes cognitive assessment a necessary part.⁽⁹⁾

The primary objective of this study is to assess the mini-mental status profile of patients in geriatric clinic in our hospital.

Aim of the Study

To observe the cognitive status of functionally independent elderly participants attending Geriatric Outpatient clinic and compare it among Gender and literacy.

MATERIALS AND METHODS

109 elderly patients (51 male and 58 female) attending the geriatric outpatient clinic of Department of Geriatric Medicine, Rajiv Gandhi Government General Hospital, Madras Medical College, Chennai were selected. The Sample size was selected for convenience. After obtaining approval from institution ethics committee informed consent was obtained from each individual and subjected to Folstein's Mini-mental State examination.

Inclusion Criteria

Willing participants above 60 years attending Geriatric outpatient clinic, Rajiv Gandhi Government General Hospital, Madras Medical College, Chennai

Exclusion Criteria

History of stroke, dementia, alcoholism, chronic intake of drugs affecting cognition, severe visual and hearing impairment.

The selected participants were subjected to the test by a trained social health worker and the data were documented and entered in MS Excel sheet. Date of birth of the participants were confirmed with their available government identification records. If not available it was approximately calculated with their age at marriage and age of their first child. MMSE was appropriately translated and explained in their local language and applied. Comorbidities were recorded. Functional status was noted. Only functionally independent elders were taken for study to rule out frank Dementia.

Statistical Analysis

For continuous data, the descriptive statistics n, Mean, SD, Median, IQR, Minimum and Maximum was presented. For categorical data, the number of patients and percentage was presented. Based on the normality of data, the parametric t test was applied to the data. All tests were two-sided at $\alpha=0.05$ level of significance. All analyses were done using Statistical Package for Social Services (SPSS) software Version 21.0 (Armonk, NY: IBM Corp).

RESULTS

		Age (Years)	MMSE Score
Total n=109			
Mean		68.25	25.30
Median		67.00	27.00
Std. Deviation		6.475	4.371
Minimum		60	13
Maximum		92	30
Percentiles	25	64.00	23.00
	50	67.00	27.00
	75	71.50	29.00
Table 1. MMSE Demographic Profile in Geriatric Participants			

Minimum age in our study group was 60 and maximum age studied was 92. Minimum MMSE score was 13 and Maximum score was 30.

MMSE Score	Frequency (n=)	Percent (%)
18 and below	12	11.0
19 to 24	29	26.6
25 and above	68	62.4
Total	109	100.0

Table 2. MMSE Score Distribution

In our study group, 12 participants (11%) scored below or equal to 18 in MMSE, 29 participants (26.6%) scored between 19 - 24 and 68 participants (62.4%) scored 25 and above-

MMSE Score	Degree of Cognitive impairment	No. of participants (n=)	Percentage (%)
30-25	Nil	68	62.4
24-19	Mild	29	26.6
18 & less	Severe	12	11

Table 3. MMSE Score and Cognitive Impairment

Gender	Frequency (n=)	Percent (%)
Male	51	46.8
Female	58	53.2
Total	109	100.0

Table 4. Gender Distribution

	Frequency	Percent
Literate	77	70.6
Illiterate	32	29.4
Total	109	100.0

Table 5. Literacy Status Distribution

Educational Level	Frequency (n=)	Percent (%)
10th	19	17.4
1 st	3	2.8
2 nd	9	8.3
3 rd	1	0.9
4 th	5	4.6
5 th	13	11.9
6 th	5	4.6
7 th	3	2.8
8 th	12	11.0
9 th	3	2.8
Diploma	1	0.9
Graduate	3	2.8
Illiterate	32	29.4
Total	109	100.0

Table 6. Education Level Distribution

Functional Status	Frequency (n=)	Percent (%)
Independent	109	100.0
Total	109	100.0

Table 7. Functional Status Distribution

Gender	N	Mean MMSE	Std. Deviation	Std. Error Mean	P value
Male	51	26.16	3.844	.538	0.0546
Female	58	24.55	4.691	.616	

Table 8. Gender and MMSE Performance

There is no statistical difference in the MMSE performance between either sexes ($p>0.05$).

Education	N	Mean MMSE	Std. Deviation	Std. Error Mean	P value
Literate	77	27.47	2.269	.259	<0.0001
Illiterate	32	20.09	3.779	.668	

Table 9. Literacy and MMSE Performance

MMSE performance is better among literates than among illiterates. ($p<0.05$).

T-Test

	Gender	N	Mean	Std. Deviation	Std. Error Mean
MMSE	Male	51	26.16	3.844	0.538
	Female	58	24.55	4.691	0.616
Group Statistics					

		Levene's Test for Equality of Variances		t-test for Equality of Means	
		F	Sig.	t	df
MMSE	Equal variances assumed	5.743	0.018	1.937	107
	Equal variances not assumed			1.962	106.496
Independent Samples Test					

		t-test for Equality of Means			
		Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower
MMSE	Equal variances assumed	0.055	1.605	0.828	-0.037
	Equal variances not assumed	0.052	1.605	0.818	-0.017
Independent Samples Test					

		t-test for Equality of Means	95% Confidence Interval of the Difference Upper
MMSE	Equal variances assumed	3.248	
	Equal variances not assumed	3.227	
Independent Samples Test			

T-Test

	Education	N	Mean	Std. Deviation	Std. Error Mean
MMSE	Literate	77	27.47	2.269	0.259
	Illiterate	32	20.09	3.779	0.668
Group Statistics					

		Levene's Test for Equality of Variances		t-test for Equality of Means	
		F	Sig.	t	Df
MMSE	Equal variances assumed	19.714	0.000	12.558	107
	Equal variances not assumed			10.294	40.610
Independent Samples Test					

		t-test for Equality of Means			
		Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower
MMSE	Equal variances assumed	0.000	7.374	0.587	6.210
	Equal variances not assumed	0.000	7.374	0.716	5.927
Independent Samples Test					

		t-test for Equality of Means
		95% Confidence Interval of the Difference
		Upper
MMSE	Equal variances assumed	8.538
	Equal variances not assumed	8.821
Independent Samples Test		

Summary

		Age (years)	MMSE
N	Valid	109	109
	Missing	0	0
Mean		68.25	25.30
Median		67.00	27.00
Std. Deviation		6.475	4.371
Minimum		60	13
Maximum		92	30
Percentiles	25	64.00	23.00
	50	67.00	27.00
	75	71.50	29.00
Statistics			

Frequency Table

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	51	46.8	46.8	46.8
	Female	58	53.2	53.2	100.0
	Total	109	100.0	100.0	
Gender					

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Literate	77	70.6	70.6	70.6
	Illiterate	32	29.4	29.4	100.0
	Total	109	100.0	100.0	
Education					

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	10th	19	17.4	17.4	17.4
	1 st	3	2.8	2.8	20.2
	2 nd	9	8.3	8.3	28.4
	3 rd	1	0.9	0.9	29.4
	4 th	5	4.6	4.6	33.9
	5 th	13	11.9	11.9	45.9
	6 th	5	4.6	4.6	50.5
	7 th	3	2.8	2.8	53.2
	8 th	12	11.0	11.0	64.2
	9 th	3	2.8	2.8	67.0
	Diploma	1	0.9	0.9	67.9
	Graduate	3	2.8	2.8	70.6
	Illiterate	32	29.4	29.4	100.0
	Total	109	100.0	100.0	
Education Level					

		Frequency	%	Valid %	Cumulative %
Valid		3	2.8	2.8	2.8
	Anaemia	1	0.9	0.9	3.7
	CAD	9	8.3	8.3	11.9
	CAD, COPD	2	1.8	1.8	13.8
	CAD, COPD, DM, SHT	1	0.9	0.9	14.7

CAD, Hypothyroidism	1	0.9	0.9	15.6
CKD	1	0.9	0.9	16.5
COPD	4	3.7	3.7	20.2
DM	13	11.9	11.9	32.1
DM, CAD	7	6.4	6.4	38.5
DM, HT	2	1.8	1.8	40.4
DM, HT, CAD, Hypothyroidism	1	0.9	0.9	41.3
DM, OA knees	1	0.9	0.9	42.2
DM, SHT	6	5.5	5.5	47.7
DM, SHT, BA, Hypothyroidism	1	0.9	0.9	48.6
DM, SHT, CAD	3	2.8	2.8	51.4
DM, SHT, Hypothyroidism	1	0.9	0.9	52.3
DM, HT, Hypothyroidism	1	0.9	0.9	53.2
Dyslipidaemia	1	0.9	0.9	54.1
Nil	8	7.3	7.3	61.5
Osteoarthritis	1	0.9	0.9	62.4
Parkinson's, CAD	1	0.9	0.9	63.3
RA, CAD, SHT	1	0.9	0.9	64.2
SHT	11	10.1	10.1	74.3
SHT, BA, CAD	1	0.9	0.9	75.2
SHT, CAD	8	7.3	7.3	82.6
SHT, CAD, BA, Hypothyroidism	1	0.9	0.9	83.5
SHT, CKD	2	1.8	1.8	85.3
SHT, DIABETES, CAD	1	0.9	0.9	86.2
SHT, DM	5	4.6	4.6	90.8
SHT, DM, CAD	6	5.5	5.5	96.3
SHT, DM, CAD, Hypothyroidism	1	0.9	0.9	97.2
SHT, DM, CKD	1	0.9	0.9	98.2
SHT, DM, Dyslipidaemia	1	0.9	0.9	99.1
SHT, Dyslipidaemia	1	0.9	0.9	100.0
Total	109	100.0	100.0	
Comorbidities				

		Frequency	Percent	Valid Percent	Cumulative Percent
	Independent	109	100	100	100.0
	Total	109	100.0	100.0	
Functional Status					

DISCUSSION

1. All the participants in this study were functionally independent elderly people. However, MMSE performance in our participants suggested a percentage of them to have varying degrees of cognitive impairment.
2. There is no statistical difference between males and females in the performance of MMSE. This was in accordance with earlier studies.⁽³⁾
3. Literates fared better than the illiterates.

CONCLUSION

The validity of the MMSE should be considered with caution and should be confirmed with other relevant tests to assess cognitive function in the elderly population.

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