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Assessment of Cognitive Function Using the Mini-Mental State Examination Among Community-Dwelling Older Adults: A Cross-Sectional Study

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Abstract

Background: Cognitive decline is a common concern of the elderly, which can have a negative impact on memory, function, independence and quality of life for older individuals. The purpose of this study was to evaluate cognitive functioning in older people in the community using the MMSE and to determine the demographic and health-related factors that are associated with cognitive functioning. **Methodology:** Cross sectional survey based (n=120) structured questionnaire included demographic data, housing status, and chronic medical conditions (i.e. diabetes, hypertension, asthma, epilepsy, lung disease, heart disease, cancer, HIV, AIDS). The cognitive status was assessed by MMSE. Descriptive analysis, independent-samples t-tests, Pearson correlation analysis and multiple linear regression were used to analyze the data obtained (p-value < 0.05). **Results:** The average total MMSE score was 24.9 ± 3.8. Of all participants, 59.2% had normal cognitive function; 32.5% had MCI and 8.3% had MCI (moderate). The age groups and educational levels/housing status differed significantly from each other in MMSE score ($p < 0.05$). Correlation between age and MMSE score was strong and negative ($r = -0.61$, $p < 0.001$) while educational level was strongly and positively correlated with MMSE ($r = 0.58$, $p < 0.001$). Educational level was the most significant positive predictor ($\beta = 0.37$, $p < 0.001$) while age was the most significant negative predictor ($\beta = -0.42$, $p < 0.001$) in multiple linear regression. **Conclusion:** The cognitive function was normal in the majority of older adults living in the community, but a significant portion of study participants had mild to moderate impairment. Better cognitive outcomes were correlated with education and older age was correlated with poorer cognitive performance.

Keywords: Mini-Mental State Examination, cognitive function, cognitive impairment, older adults, memory assessment, aging

Introduction

Population ageing is a major public health issue of today and is a growing phenomenon globally because of better longevity. As the ages progress, it is common to experience a number of physiological and neurological changes that can manifest themselves in cognitive abilities like memory, attention span, language, orientation, and executive function [1]. Cognitive changes may impact on a person's ability to be independent in his/her daily functioning and can have a negative impact on quality of life [2, 3]. Cognitive impairment can vary from minor memory loss and attention deficits to more serious cognitive decline and dementia [4]. Therefore it is important to understand the distribution of cognitive function and its associated determinants among older adults, for healthcare planning and community-based interventions [5]. Several factors have been linked with age-related cognitive decline: chronic medical disorders (such as hypertension and diabetes mellitus), lower educational level, social isolation, loneliness, and advanced age [6].

The MMSE is a commonly used clinical and community based screening instrument to assess cognitive functioning [7,8]. The MMSE is still widely employed due to its brevity, simplicity and ease of administration in elderly populations, but recent studies suggest that both age and educational level may influence MMSE performance and that education adjusted interpretation may be relevant in elderly populations of varying educational status [9]. The older adults in the community are a significant population to be assessed for cognitive function as impairments may be evident only after significant cognitive decline [10]. Cognitive screening in the community setting can assist in the early detection of cognitive change and prompt referral, counselling, lifestyle changes and management of underlying health issues. While cognitive impairment is

increasing among older people, there is still limited evidence on cognitive function and the factors that are associated with it in many community settings [11,12].

The present study was therefore conducted to evaluate the cognitive functions in older adults in the community using MMSE. Results can be used to facilitate early identification of older people who are at risk of cognitive decline and early counselling, referral and help to prevent cognitive decline. This study could also contribute to the evidence base that could be used for the planning of community-based screening and health promotion strategies for healthy ageing.

Methodology

To evaluate cognitive function of older adults was done by conducting a community based cross sectional study with MMSE. The study was conducted in selected community settings for three months from January to March 2026. The study was based on older adults who were living in their own homes or with relatives. Older people (60 years and over) living in the study area were included in the study. A total of 120 participants were recruited. Participants with severe hearing loss, severe visual loss, psychiatric illness, as well as severe neurological disorders that could affect the cognitive assessment were excluded. Eligible subjects were identified through a convenience sampling method at community centers, residential neighborhoods and outpatient health care facilities. Subjects who fulfilled the inclusion criteria were invited to participate as volunteers, informed consent was obtained.

All participants were asked to participate of their own free will; all participants signed informed consent forms before being enrolled. Participants' information was kept confidential and anonymous throughout the study. The study was performed in ethics according to the Declaration of Helsinki and institutional research guidelines. A structured questionnaire of two sections was used for data collection. The information collected for age, sex, educational status, living status, and the presence of chronic diseases (hypertension and diabetes mellitus) was done by interview of the participants in section I. In Section II: Cognitive function, the MMSE a widely-used and standardized test to screen for cognitive impairment, was used. The MMSE assesses six cognitive functions: orientation, registration, attention and calculation, recall, language and visuospatial ability. The maximum score is 30 and the higher scores the better the cognitive function.

MMSE scores were classified based on standard classification criteria of Normal cognition (24 – 30 points), Mild cognitive impairment (18 – 23 points), Moderate cognitive impairment (10 – 17 points), Severe cognitive impairment (<10 points). Specific scores were calculated for the different domains to help determine areas of cognitive difficulty for participants. Content validity was ensured by having experts in geriatrics and community health review the questionnaire. To assess clarity and feasibility of the data collection process, a pilot study was conducted with 10 older adults. The MMSE is a commonly-used instrument which has been found to be valid and reliable for cognitive screening in the older age group. Data was entered into the SPSS version 25.0 and analyzed. Data were presented descriptively as frequencies, percentages, means and SDs. Independent-samples t-tests and ANOVA were used to compare MMSE scores among the various demographic groups. Pearson correlation was used to determine the correlation between MMSE score and selected study variables. Multiple linear regression was finally carried out to determine independent factors that influence cognitive function. Statistically significant was set at a p value of < 0.05.

Results

Overall, there were 120 community-dwelling elderly people in the study, of which 55.0 % were female. The age group 60-69 years had the largest number of participants (40.0%), followed by 70-79 years (38.3%). The majority of the participants resided with family members (76.7%) and 56.7% reported experiencing hypertension while 35.0% reported that they had diabetes as shown in table 1.

Table 1: Demographic Characteristics of Participants (n = 120)

Variable	Category	N (%)
Gender	Male	54 (45.0)
	Female	66 (55.0)
Age Group (years)	60–69	48 (40.0)
	70–79	46 (38.3)
	≥80	26 (21.7)
Educational Status	No Formal Education	22 (18.3)
	Primary Education	38 (31.7)
	Secondary Education	35 (29.2)
	Higher Education	25 (20.8)
Living Status	Alone	28 (23.3)
	With Family	92 (76.7)
Hypertension	Yes	68 (56.7)
Diabetes Mellitus	Yes	42 (35.0)

Participants achieved the highest mean scores in the orientation (8.1 ± 1.4) and language (7.4 ± 1.2) domains. Lower performance was observed in recall (2.1 ± 1.0) and attention/calculation (3.7 ± 1.4), indicating challenges in memory-related cognitive functions. The overall mean MMSE score was 24.9 ± 3.8, suggesting generally preserved cognitive function among the study population as shown in table 2.

Table 2: MMSE Domain Scores among Participants

MMSE Domain	Mean ± SD
Orientation	8.1 ± 1.4
Registration	2.8 ± 0.5
Attention and Calculation	3.7 ± 1.4

Recall	2.1 ± 1.0
Language	7.4 ± 1.2
Visuospatial Ability	0.8 ± 0.4
Total MMSE Score	24.9 ± 3.8

Based on MMSE classification, 59.2% of participants demonstrated normal cognitive function. Mild cognitive impairment was identified in 32.5% of older adults, while 8.3% exhibited moderate cognitive impairment. No participant met the criteria for severe cognitive impairment, indicating a relatively favorable cognitive profile within the study sample as shown in table 3.

Table 3: Cognitive Function Categories Based on MMSE Scores

Category	MMSE Score	N (%)
Normal Cognition	24–30	71 (59.2)
Mild Cognitive Impairment	18–23	39 (32.5)
Moderate Cognitive Impairment	10–17	10 (8.3)
Severe Cognitive Impairment	<10	0 (0.0)

Significant differences in MMSE scores were observed across age groups, educational levels, and living arrangements. Younger participants and those with higher educational attainment demonstrated significantly better cognitive performance than their counterparts ($p < 0.001$). Individuals living with family members also showed higher MMSE scores compared to those living alone ($p = 0.004$) as shown in table 4.

Table 4: Comparison of MMSE Scores According to Participant Characteristics

Variable	Mean MMSE ± SD	p-value
Male	25.6 ± 3.4	0.021
Female	24.3 ± 4.0	
Age 60–69	27.0 ± 2.5	<0.001
Age 70–79	24.5 ± 3.2	
Age ≥80	21.2 ± 4.1	
No Formal Education	21.1 ± 4.3	<0.001
Higher Education	28.0 ± 1.9	
Living Alone	22.9 ± 4.0	0.004
Living With Family	25.5 ± 3.5	

Age showed a strong negative correlation with MMSE scores ($r = -0.61$, $p < 0.001$), indicating declining cognitive performance with increasing age. Educational level demonstrated a strong positive association with cognitive function ($r = 0.58$, $p < 0.001$). Additionally, hypertension and diabetes exhibited weak but statistically significant negative correlations with MMSE scores as shown in table 5.

Table 5: Correlation between MMSE Scores and Selected Variables

Variable	r	p-value
Age	-0.61	<0.001
Educational Level	0.58	<0.001
Living Status	0.29	0.002
Hypertension	-0.24	0.009
Diabetes Mellitus	-0.21	0.018

The strongest negative predictor of MMSE scores ($\beta = -0.42$, $p < 0.001$) in multiple regression was age. Education level was a strong positive predictor ($\beta = 0.37$, $p < 0.001$) and living with family was independently associated with good cognitive outcome. Participants had relatively higher scores in orientation and language domains. Fewer cases of low scores were seen for recall and attention/calculation. The mean total MMSE score was 24.9 ± 3.8. There was a significant decrease in MMSE scores as age increased. High school education and above was significantly associated with improved cognitive function as shown in table 6.

Table 6: Multiple Linear Regression Analysis Predicting MMSE Scores

Predictor	β	SE	p-value
Age	-0.42	0.07	<0.001
Educational Level	0.37	0.09	<0.001
Living Status	0.19	0.08	0.015
Hypertension	-0.12	0.06	0.041
Diabetes Mellitus	-0.09	0.05	0.087

Age emerged as the strongest negative predictor of cognitive function, while educational level was the strongest positive predictor. Living with family was independently associated with better cognitive performance. The model explained 48% of the variance in MMSE scores.

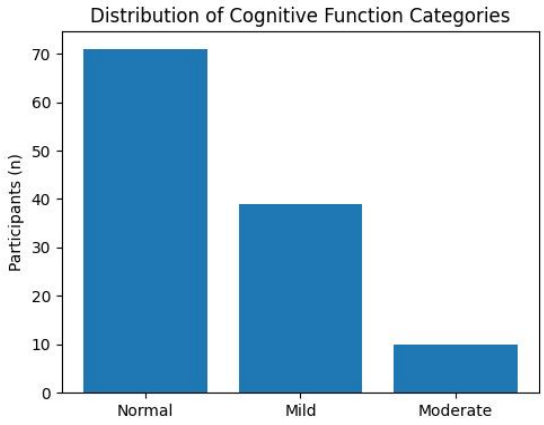

Figure 1: Distribution of cognitive function categories among community-dwelling older adults based on MMSE scores. Normal cognition was observed in the majority of participants, followed by mild and moderate cognitive impairment.

The age-related decline in cognitive performance was observed among the study participants. The mean MMSE scores of individuals aged 60–69 years, 70–79 years and ≥80 years were 27.0 ± 2.5, 24.5 ± 3.2 and 21.2 ± 4.1, respectively. The results suggest that there was a gradual decline in cognitive function as age increased.

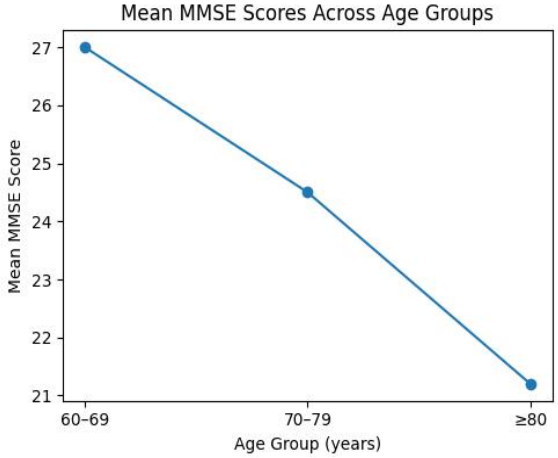

Figure 2: Mean MMSE scores across age groups. Cognitive performance demonstrated a progressive decline with increasing age, with participants aged ≥80 years exhibiting the lowest mean MMSE scores.

Discussion

Results revealed that the majority of the participants had normal cognitive function and a significant number had mild to moderate cognitive impairment. The mean MMSE score was 24.9 ± 3.8, reflecting largely good cognitive function in the study population, but in a significant number of older adults, cognitive function was early in the process of decline. The results that 59.2% of the participants' cognition was normal, 32.5% had mild cognitive impairment, and 8.3% had moderate cognitive impairment are similar to the findings of recent community-based and population studies, which reported that cognitive impairment is still prevalent in older adults living in the community [13]. The results of this study suggest that there is a significant number of community-dwelling older people with subtle cognitive impairment that may deteriorate if not identified and treated early [14]. Almost one-third of participants had some degree of mild cognitive impairment, underscoring the value of regular cognitive screening in the community for early identification of persons at risk [15,16].

The relatively high scores in the orientation and language domains along with the low scores in the memory, recall, and attention/calculation domains in the present study are also similar to the results of a number of community-based studies from Iran, Egypt, and China, which found that memory, recall, attention and calculation are the most frequently affected cognitive domains in older adults [17]. The strong negative correlation between age and MMSE score in the present study was consistent with previous studies showing that cognitive performance declines with age [18,19]. The weak positive correlation of MMSE and educational level was consistent with previous studies which reported higher education was associated with better cognitive screening performance and may reflect greater cognitive reserve [20]. The MMSE and social

isolation (living with family) were significantly associated; living alone was associated with lower MMSE scores, and this finding was supported by recent studies reporting that social isolation and reduced social support are associated with poorer cognitive ability among older adults [21,22]. The negative and borderline non-significant association of hypertension and diabetes with MMSE scores were also supported by recent evidence that vascular and metabolic risk factors are associated with elevated risk of cognitive impairment [23,24].

Multiple linear regression analysis also showed that age was the most significant independent factor affecting cognitive function, while education level was the most significant positive predictor for MMSE performance. The child's cognitive outcomes were also strongly linked with living with the family even after controlling for other factors. The positive effect of family living conditions may reflect the positive effects of social engagement, emotional support and greater involvement in cognitively stimulating activities [25,26].

The results suggest that cognitive screening at routine intervals is recommended for older adults with/without cognitive impairment in the community, especially those over the age of 70, those who are less educated, persons living alone, and those with chronic diseases like hypertension or diabetes. Awareness sessions, periodic cognitive assessment, chronic disease control, family counselling and referral procedure for older adults who have signs of cognitive impairment should be incorporated into community health programs. Health workers should also provide education to families on early signs of cognitive impairment and the need for social support, mental stimulation and regular medical monitoring. Larger multicenter samples, longitudinal designs, and comprehensive neuropsychological assessment tools should be employed to gain a deeper understanding of cognitive decline and its predictors in older adults in future studies. While the majority of participants had normal cognitive performance, mild and moderate impairment suggests that early screening at a community level is required. Cognitive awareness, family support and periodic surveillance might prevent further cognitive decline and enhance lifestyle of old persons.

Conclusion

In conclusion, the majority of older adults living in the community had normal cognition, but a significant number had cognitive impairment of mild to moderate severity. Higher age and poor performance on MMSE was correlated, whereas higher educational level and living with family was correlated with better cognitive outcomes. The results highlight the need for regular cognitive assessment, chronic disease management, family support and community-based approaches to achieving good cognitive well-being in older people.

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Conflict of Interest

None

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None

Use of Artificial Intelligence

The corresponding author declared that no artificial intelligence or AI-assisted tools were used in this manuscript.

Authors' Contribution

KZ, AS and NK contributed significantly and equally as per ICMJE. All authors gave their final approvals to publish this article.

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