

Correlation between Mild Cognitive Impairment and Functional Status among Elderly

Amer MS, Akkad RM, El Sayed M

Geriatric Medicine & Gerontology department, Faculty of Medicine, Ain Shams University, Cairo, Egypt.

Abstract

Background: Recently, no standard criteria exist with regard the specific or theoretical definition of minimal functional limitation in people with MCI.

Aim: To Correlate mild cognitive impairment and functional status among elderly.

Methods: A cross sectional study conducted on 225 participants at nursing homes in Egypt. A comprehensive geriatric assessment including medical history and physical examination was carried out for each participant. Cognitive functions were evaluated using both the Arabic translation of the Mini-Mental State Examination (MMSE) and the Arabic version of the Montreal Cognitive Assessment test (MoCA). Taking in account educational level, where diagnoses of mild cognitive impairment (MCI) if MMSE \leq 17 for illiterates; MMSE \leq 20 for primary school graduates (\geq 6 years of education), MMSE \leq 24 for junior school graduates or above (\geq 9 years of education) and MoCA with Score less than or equal 24 indicates MCI in illiterate, Functional assessment was done by the Activities of Daily Living (ADL) scale, and the Instrumental Activities of Daily Living (IADL) scale.

Results: This study indicates that there is no significant difference between those with MCI and those with normal cognitive function in ADL and IADL.

Conclusions: MCI is frequent in older people. Our study suggests that there is no significant difference between those with MCI and those with normal cognitive function in ADL and IADL. Further studies are needed to determine the correlation between MCI and function status.

Keywords: MCI, Cognition, Function

Background:

Mild cognitive impairment (MCI, also known as incipient dementia, or isolated memory impairment) is a brain function syndrome involving the onset and evolution of cognitive impairments beyond those expected based on the age education of the individual, but which are not significant enough to interfere with their daily activities¹. The concept of mild cognitive impairment was aimed to fill the gap between normal and dementia-type pathological ageing². Also, the MCI concept assumes that a cognitive continuum exists

amongst normality and Alzheimer's disease, the main cause of dementia³. The MCI criteria, as defined by **Petersen et al.**, include the following: Absence of dementia, memory problem, objective memory disorder, Normal general cognitive function, and Absence of other cognitive disorders or repercussions on daily life⁴.

The initial diagnostic criteria for mild cognitive impairment specified generally intact everyday functioning¹. The Functional abilities allude to a scope of self-initiated, multidimensional, everyday skills and

activities necessary for independent for everyday living inside the home and community ⁵.

Later an international working group on MCI suggested the inclusion of “preserved basic [activities of daily living]/some minimal impairment in complex instrumental function” in the process of diagnosis ⁶.

Another study et al suggested the presence of difficulties in everyday abilities in MCI groups has accumulated ^{7, 8, 9}. Greater functional impairment in mild cognitive impairment has been connected with improved prediction of dementia and a more stable definition of mild cognitive impairment over time ¹⁰.

Although, the guidelines related to functional changes in individuals with MCI are indistinct and reflect our currently limited, though developing, and knowledge concerning the types, extent, and nature of functional change that develops with MCI. Recently, no standard criteria exist with regard the specific or theoretical definition of minimal functional limitation in people with MCI ¹¹.

Concerning the report of cognitive complaints as well as objective cognitive impairment, the clinical diagnosis of both MCI and dementia overlap with each other ¹². The two disorders vary in the further requirement for MCI individuals to have maintained independence in functional abilities. This is typically researched by method for an exhaustive meeting with the individual and with the closest relative, and registered in terms of (ADL) activities of daily living and (IADL) instrumental activities of daily living scales. Very mild issues in instrumental ADL are mostly consistent with MCI; however basic ADL ought to be preserved ¹². Even though, there was no constant agreement about which domains of IADL are commonly that is, typically or potentially particularly impaired in MCI and additionally which sort of instruments may distinguish those best. However, a clear trend has emerged with activities that require higher cognitive procedures being reliably influenced. Additionally, the utilization of performance-based measures as well as technology-related items appears to be promising ¹³.

Methods

This is cross sectional study conducted at nursing homes at Cairo. Using sample size calculation formula

$$n = \frac{p(1-p)(z_{\alpha/2})^2}{d^2}$$
 ¹⁴, where *d* is the degree of precision (assumed 5.0%), *z* is the value of α error (assumed 5.0%), while *p* is the prevalence of mild cognitive impairment 16.6% ⁹; the calculated **sample size is 225**

The Inclusion criteria

Elderly males and females who were 60 years and older and with an oral consent to participate and were able to answer questionnaire during the interview.

The Exclusion criteria:

Those who refuse to participate in our study, elderly who were diagnosed as having dementia and with sever

hearing and visual impairment and are unable to continue the interview.

Each participant was subjected to comprehensive geriatric assessment including medical history and physical examination.

To asses cognitive function we used the Arabic version¹⁵ of The Mini-Mental State Examination (MMSE) **16** was performed to assess global cognitive function and the Arabic version¹⁷ of the Montreal Cognitive Assessment (MoCA) ¹⁸.

Functional assessment was done by the Activities of Daily Living (ADL) ¹⁹ scale, and the Instrumental Activities of Daily Living (IADL) scale ²⁰. GDS for screening of depression using the Arabic version ²¹ of geriatric depression scale (GDS) ²².

In this study MMSE was used with the subjects' education taken into account diagnosed as mild cognitive impairment (MCI) if MMSE≤17 for illiterates; MMSE ≤20 for primary school graduates (≥6 years of education), MMSE≤24 for junior school graduates or above (≥9 years of education) ²³, and MoCA with Score less than or equal 24 indicates MCI ^{24, 25}.

Statistical Analysis

Quantitative data are presented as mean ± standard deviation (SD). Frequency and percentage for all qualitative variables were used. Comparison between quantitative variables was done using t-test to compare two groups. Comparison of qualitative variables was done using chi square test. Correlation coefficient was also done to find linear relation between different variables using Pearson correlations co-efficient. The Statistical Package for the Social Sciences (SPSS) program, version 20.0 was used as the statistical software program, *p* < 0.05 was considered to be statistically significant

Results

Among the 225 participants 121 (53.8%) were males and 104 (46.2%) were females. It was found that 31.6% their age range from 60 to 64, 34.2% their age range from 65 to 70 and 34.2% their age above 70 years old. It is found that 21.3% of the participants were illiterate, 27.1% had primary graduates' ≥ 6 years and 51.7% had ≥ 9 years education. The prevalence of Mild Cognitive Impairment using MMSE is 17.3%, MoCA is 24.9%, There was no significant difference between those with MCI and those with normal cognitive function regarding educational level using different screening methods (P=0.062 using MMSE and P=0.798 using MoCA). Both MMSE and Moca had higher prevalence of MCI with increasing ageing in which (P-value 0.000). There was no significant difference between those with MCI by MMSE and those with normal cognitive function regarding functional status using different screening methods. (P =0.646 for ADL and P =0.693 IADL). Also, there was no significant difference between those with MCI and those with normal cognitive function by MoCA regarding functional

status using different screening methods. (P =0.564 for ADL and P =0.564 IADL).

Table 1: Prevalence of mild cognitive impairment using different screening tests

		No.	%
MMSE	Normal	186	82.7%
	MCI	39	17.3%
MoCA	Normal	169	75.1%
	MCI	56	24.9%

Table 2: The relation between age, gender and MCI.

Variables		MMSE		MoCA	
		Normal	MCI	Normal	MCI
Age 60-64 (No =71)	No.	67	4	63	8
	%	94.4%	5.6%	88.7%	11.3%
Age 65-70 (No =77)	No.	64	13	61	16
	%	83.1%	16.9%	79.2%	20.8%
Age > 70 (n No =77)	No.	55	22	45	32
	%	71.4%	28.6%	58.4%	41.6%
P value		0.001		0.000	
Male (NO=121)	No.	98	23	90	31
	%	81.0%	19.0%	74.4%	25.6%
Female (NO=104)	No.	88	16	79	25
	%	84.6%	15.4%	76.0%	24.0%
P value		0.474		0.784	

Table 3: Relation between MCI and different education levels

		Illiterate(NO =48)		primary school		Senior school		P-value
		n.	%	n	%	n.	%	
		MMSE	Normal	45	93.8	50	82	
MCI	3		6.3	11	18	25	21.6	
MoCA	Normal	36	75	44	72.1	89	76.70	0.798
	MCI	12	25	17	27.9	27	23.3	

Table 4: Relation between MCI and functional status using MMSE

		MoCA				P-value
		Normal		MCI		
		No.	%	No.	%	
ADL	independent (6)	168	99.4%	56	100.0%	0.564
	assisted (1-5)	1	0.6%	0	0.0%	
	dependent (0)	0	0.0%	0	0.0%	
IADL	independent(8)	163	96.4%	53	94.6%	P=0.564
	assisted (1-7)	6	3.6%	3	5.4%	
	dependent(0)	0	0.0%	0	0.0%	

Discussion:

The prevalence of mild cognitive impairment is increasing among both developed and developing countries. Rapid demographic ageing in both low- and middle-income countries makes it a priority to identify the people who are at the risk of developing dementia at early stages for different targeting preventive intervention ²⁶.The prevalence of mild cognitive impairment that varies widely in different research can be due to the use of different definitions ²⁷.

Available studies indicates that the prevalence of MCI ranges from 7.7% to 42.0% depending on the diagnostic criteria used to make the diagnosis, the country where the study was conducted, the age groups under consideration,different methodology and definitions ²⁸. In this study we found that the prevalence of MCI among elderly in geriatric homes in Cairo using MMSE was 17.3%, MOCA is was 24.9%.

The MMSE was the most studied instrument used to detect MCI; there are various studies used different cut-points, had different proportions of underlying MCI ²⁹. Decreasing cut point is better for detecting MCI especially in illiterate individuals. This has been used in China with the subjects' education taken into account diagnosed as mild cognitive impairment (MCI) if MMSE≤17 for illiterates; MMSE ≤20 for primary school graduates (≥6 years of education), MMSE≤24 for junior school graduates or above (≥9 years of education), in which prevalence was 18.5% ²⁷, also in our study we used the same cut off points for MMSE to detect MCI taking into consideration educational level and the prevalence of MCI was 17.3% which was near to that of **Su X et al.**

Moreover in one population study in Quena, Egypt in which crude prevalence rate was 1.74/100, using scores 28 instead of 30points for illiterate ³⁰.

In this study the prevalence of MCI by MOCA was higher (24.9%) than that of MMSE (17.3%) this can be explained that MoCA is superior to MMSE for detection of MCI ³¹ Using scores less than or equal 24 has higher specificity 87% and accuracy 86% in detecting MCI among illiterate by MOCA. ^{32, 33}. In study done by Cecato, J.F., the prevalence was 32.3 %, using MoCA test score≤ 23 for MCI ³³.

With regard to demographic characteristics, the most significant factor that is associated with MCI in the current study is advanced age but not sex and poor educational status.

This study indicates that mild cognitive impairment increase significantly with age (P-value 0.000), using MMSE and MoCA. This correlated with the Mayo Clinic Study of Aging which stated that the prevalence of mild cognitive impairment increases with age. ³⁴ Also, a number of prospective population based studies estimate the prevalence among older adults (>70 years) to be between 14 and 18 percentage ³⁵.Moreover, the same correlation between MCI and age is indicated in another 3 studies in *et al* Egypt ^{30,36,37}.

Although some studies indicated higher prevalence in

men³⁴ or higher prevalence in women³⁸. In this study, there was no significant difference between those with MCI and those with normal cognitive function regarding sex using different screening methods (P=0.474 using MMSE, P=0.784 using MOCA). This is these findings correlated with previous studies as³⁹, also this agreed with another Egyptian study that indicated no sex difference in MCI prevalence³⁷. Regarding educational level, there was no significant difference between those with MCI and those with normal cognitive function regarding education level using different screening methods (P=0.062 using MMSE, P=0.798 using MOCA) This is consistent with some studies^{40,41} and disagrees with 2 Egyptian studies^{36,37}.

Regarding the functional status of MCI participants; this study indicates that there is no significant difference between those with MCI and those with normal cognitive function in ADL (P=0.564). The fact that individuals with MCI have preserved ADL correlated with the diagnostic criteria of MCI³². Although, the guidelines related to functional changes in individuals with MCI are indistinct and reflect our currently limited, though developing, and knowledge concerning the types, extent, and nature of functional change that develops with MCI. Recently, no standard criteria exist with regard the specific or theoretical definition of minimal functional limitation in people with MCI⁴².

In the current study, there is no significant difference between those with MCI and those with normal cognitive function regarding functional status using Instrumental Activities of Daily Living (P=0.564). This agrees with studies done by Jefferson AL and Burton CL^{43, 44} yet, this disagrees with two Egyptian cross sectional studies in 2011 and 2012 respectively^{36, 37}.

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