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Comparison between two common tools for cognitive screening in a sample of illiterate Egyptian seniors

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Abstract

Background:
Mild cognitive impairment (MCI) and mild dementia are common problems in the elderly that may pass unnoticed till deteriorated or affect elderly's function especially activities of daily living (ADL). MCI is also associated with significant morbidity and mortality. Patients with MCI may develop any type of dementia as Alzheimer's disease (AD), vascular dementia and other types of dementias by rates about 8.1%, 1.9% and 9.6% respectively per year, so early detection and management will benefit both patient and caregiver. Non amnestic MCI is less common to progress to dementia than amnestic type while about 16% of cases may regress to normal. Due to the absence of actual disease-modifying treatment for late dementia, diagnosis and disease involvement at an early stage especially at the MCI stage has been widely accepted as a critical policy in disease management that could consequently affect long-term results and prevent its progression. MCI can be diagnosed using mental status evaluation in addition to other neurological, psychiatric, medical examination, neuroimaging and biological biomarkers. There are a lot of tools that can be used for screening of cognitive impairment of variable degrees of sensitivity and specificity such as Minimental State Examination (MMSE) and Montreal Cognitive Assessment Basic (MoCA-B). The aim of the work is to compare between MMSE and MoCA-B, which are commonly used cognitive screening tools, in illiterate Egyptian seniors.
Methods: An observational clinical study was conducted on 100 illiterate Egyptian elderly having variable comorbidities aged ≥ 60 years recruited from the outpatient clinics of Mansoura university hospitals. Full history taking, comprehensive geriatric assessment, Minimental State Examination (MMSE) and Montreal Cognitive Assessment Basic (MoCA-B) were performed for all participants.
Results: The current study showed that patients diagnosed as normal by MMSE were graded MCI and mild dementia by MoCA-B and so there was no significant agreement between MoCA-B and MMSE scale grades among the studied cases in illiterate Egyptian seniors ≥ 60 years (p=0.062).
Conclusions:
No agreement between MoCA-B and MMSE scale grades among the studied cases.
Keywords:
Cognitive function, illiterate, elderly, Egyptian, MMSE, MoCA-B.

Introduction:

Ageing is a chief risk factor for developing multiple diseases in elderly especially neurodegenerative diseases as dementia, multiple sclerosis and Parkinson's disease. This occurs due to what is called cellular senescence which is a natural process that has an important role in accelerated ageing. This increases comorbidities and mortalities in this age group leading to increasing health care demands and costs. It was found that accumulation of senescent cells in nervous system not only caused neurodegenerative diseases, but also worsens the condition in healthy elderly with cognitive deficits [1]. The DSM-5 criteria has described the diagnostic criteria for dementia [2].

It is a global health problem with high costs and economic burden in caregivers and the country, estimated to be about 26 billion pounds annually in the United Kingdom in 2014, therefore, the early prediction in early stages and screening of mild cognitive impairment (MCI) is a must [3]. Due to the absence of actual disease-modifying treatment for late dementia, diagnosis and disease involvement at an early stage especially at the MCI stage has been widely accepted as a critical policy in disease management that could consequently affect long-term results [4].

MCI is considered an intermediate state between the age related changes of cognitive function and the earliest clinical features of dementia which can progress to any type of dementia mostly Alzheimer's disease (AD) or being non-progressive according to the control of risk factors [5,6], but isn't severe enough to affect activities of daily living (ADL), but with mild affection of instrumental activities of daily living (IADL) and may be unnoticeable except to close contacts[7].

MCI is associated with significant morbidity and mortality. Patients with MCI develop dementia especially Alzheimer's disease (AD) by rates about 5-10% annually ,but most of them will not progress to dementia that is called non progressive MCI [8]. MCI can be diagnosed using mental status evaluation in addition to other neurological, psychiatric, medical examination, neuroimaging and biological biomarkers [9]. These biomarkers can also predict its liability for progression to dementia

as cerebrospinal fluid (CSF) phosphorylated tau (p-tau) and amyloid ($A\beta_{1–42}$) [10,11].

In Egypt, the prevalence of AD and MCI is considered high, but most MCI cases are non-progressive to AD. These high prevalence rates were discovered to be higher among the illiterate population [12]. Studies found that the higher incidence of cognitive impairment was among Qena governorate population more than 60 years old in both rural and urban regions. Also, it had more incidence between males in comparison to females [13,14].

Mini Mental Status Examination (MMSE) is the most popular used tool for cognitive assessment worldwide especially in major neurodegenerative disorders with 99% specificity, 66% sensitivity and 89% accuracy [15]. However, it has limited role in assessment of some aspects of cognition as the visuospatial domain that is represented by only one question [15] , its language is difficult, so it is not suitable for low educated patients [16] and has low ability in prediction of future drop in cognitive capabilities [17].

Montreal Cognitive Assessment Basic (MoCA-B) is a comprehensive cognitive screening instrument and more challenging in memory recall in comparison to MMSE, formed by Nasreddine and had been translated and adjusted into about 30 languages all over the world with a cutoff point of 26 for detection of MCI [18].

The sensitivity of MoCA for diagnosis of MCI was found to be significantly higher than MMSE with a cutoff point ≤23 with increased sensitivity up to 96% and specificity up to 95% in highly educated individuals [19]. While it was found that the optimal cutoff point for MCI screening in illiterates was <13 with high sensitivity and low specificity [20].

The aim of the work is to compare between MMSE and MoCA-B, which are commonly used cognitive screening tools, in illiterate Egyptian seniors.

Methods: An observational clinical study recruited 100 illiterate from the outpatient clinics of Mansoura University hospitals. All participants were 60 years and over. All seniors presented to the clinic satisfying the inclusion criteria were included until the sample size was satisfied. Those who refuse to participate in the study, educated patients and patients diagnosed to be depressed or demented by history and on treatment were excluded. The sample size was based on PASS 11th release [21], a

sample size of 93 produces a two-sided 95% confidence interval with a width equal to 0.11 for Pearson correlation coefficients of 0.860 between the examined scales items [22] and we increase it to 100 cases.

Clinical assessment:

Seniors received full comprehensive geriatric assessment including cognitive assessment one time using MMSE, that is still the most commonly used tool for cognitive assessment worldwide, then via MoCA-B in the same session and with the same interviewer to avoid practice issues or any acute condition to affect results.

Ethical considerations:

Approval from the ethical committee was obtained from Ain Shams University (FMASU M S 85/2019) and informed consent from all participants. Confidentiality of data was assured. Patients suffering from cognitive impairment were informed and referred to further.

Statistical analysis:

The collected data was coded, tabulated, and statistically analyzed using IBM SPSS statistics (Statistical Package for Social Sciences) software version 22.0, IBM Corp., Chicago, USA, 2013 and Microsoft Office Excel 2007.

Descriptive statistics was done for quantitative data as minimum& maximum of the range as well as mean±SD (standard deviation) for quantitative normally distributed data, while it was done for qualitative data as number and percentage.

Inferential analysis was done for quantitative variables using Shapiro-Wilk test for normality testing. In qualitative data, inferential analyses for independent variables was done using Kappa test for agreement between paired categorical data. The level of significance was taken at P value < 0.050 is significant, otherwise is non-significant.

Kappa=Observed agreement–chance agreement / 1–chance agreement

Results:

The sample of the study was one hundred illiterate Egyptian elderly ≥ 60 years old, 46% of them were males and 54% were females with multiple comorbidities, 42% were diabetic, 52% were hypertensive, 32% had ischemic heart disease and 24% had dyslipidemia. Other less prevalent comorbidities were stroke, renal diseases, hepatic diseases,

hypothyroidism and anemia. About 62% of cases were married while 38% were widow. Also, 96% were retired and only 4% were still working. Financially, about 47% of them were satisfied by their pension while 53% were supported by their sons. There was no difference noticed in results as regard the demographic data, but no statistical analysis for its relation to the results was done.

MMSE and MoCA-B were performed to all participants and found that mean score for MMSE was 23.9±2.4SD and 14.4±3.5SD for MoCA-B. Also, about 45% of cases had normal score by MMSE and 47% had mild dementia (table 1). Also, 18% of cases had MCI by MoCA-B and 68% had mild dementia without any normal cases or cases with severe dementia (table 2). When both results were compared, we found that the normal cases by MMSE had MCI in 14% of cases and mild dementia in 31% by MoCA-B scale while 32% of mild dementia cases by MMSE had also mild dementia by MoCA-B (table 3).

Table (1): MMSE scale among the studied cases:

Variables		Mean±SD	Range
Score		23.9±2.4	12.0–27.0
		N	%
Grades of MMSE (n, %)	**Normal**	45	45.0
	Mild	47	47.0
	Moderate	8	8.0

Total=100 cases

Table (2): MoCA-B scale among the studied cases:

Variables		Mean±SD	Range
Score		14.4±3.5	6.0–23.0
		N	%
Grades of MoCA-B scale (n, %)	**Impaired (MCI)**	18	18.0
	Mild	68	68.0
	Moderate	14	14.0

Total=100 cases

Table (3): Agreement between MoCA-B and MMSE scale grades among the studied cases:

MoCA-B grades	MMSE grades				Kappa	P-value
	Normal	Mild	Moderate	Severe		
Impaired (MCI)	**14 (31.1%)**	4 (8.5%)	0 (0.0%)	0 (0.0%)	0.133	0.062
Mild	31 (68.9%)	**32 (68.1%)**	5 (62.5%)	0 (0.0%)		
Moderate	0 (0.0%)	11 (23.4%)	**3 (37.5%)**	0 (0.0%)		
Severe	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)		

Percentages were from MMSE grades. ^Kappa test

Discussion:

There are multiple requirements for proper effective tools for cognitive assessment including; practical and diagnostic issues. Practical requirements include; being brief as these patients have problems in attention making long tests unreliable, must avoid leading questions, avoid sharing caregivers in the test, avoid questions that make patients anxious and should require minimal training. Diagnostic issues include; test must have high specificity and sensitivity in differentiation between the normal aging process and diseased and must cover all aspects of cognitive domains [15].

Although the current study didn't routinely assess patient's acceptance and satisfaction, we noticed that all patients and their caregivers were happy and even grateful to receive cognitive assessment using MMSE and MoCA-B, so the length of the test didn't affect the results.

MMSE so far has been the golden standard for screening cognition in elderly. Recently, a shift from screening for dementia to screening for MCI has questioned the use of MMSE due to its low specificity and sensitivity in MCI, but it can be used for detection of the progression from MCI to dementia by changing in MMSE score overtime rather than single measurement [23].

The current study showed as regard the MMSE scale that the mean score in the sample was 23.9 with 2.4 SD more or less. According to that we found that 45% of cases had normal MMSE score according to age and educational level while about 47% of cases had mild dementia and 8% of them had moderate dementia.

Rabi et al., 2009 and Pozueta et al., 2011 declared that MMSE was defective in screening of MCI and even difficult in differentiating between the normal aging process and early stages of dementia despite its wide use as a cognitive screening tool [24,25].

The current study showed that there was no significant agreement between MoCA-B and MMSE scale grades among the studied cases as MMSE couldn't detect MCI cases that were detected by MoCA.

Although our cases had no past history for dementia and their caregivers didn't notice any cognitive or ADL and IADL affection, the current study showed that the majority of cases (68%) had mild dementia by MoCA-B scale, about 18% of cases had MCI, and about 14% of cases had moderate dementia. There were no normal cases according to MoCA-B scale assessment in our study. This confirmed the gap between cognitive screening via MMSE and MoCA.

Ciesielska and team in a study in 2016 deduced that MMSE had a limited role in detection of MCI in comparison to MoCA, but it was still the most commonly used tool for cognitive screening in elderly [26].

O'Caoimh and colleagues in 2016 proved that MoCA overcame the high ceiling effects and educational bias found in MMSE [27].

Similarly, Luis, Abd Razak and their teams with a ten year difference in their studies agreed that MoCA is one of the most accepted and validated tools to be used for screening of MCI and must be used on a wide scale [28,29].

In the current study, the absence of normal cases by MoCA-B may be explained either by overestimation of cognitive impairment in illiterate elderly despite validation of the tool by Luis et al., and Abd Razak et al., or by missed early cognitive impairment in this population. The latter can be due to decreased awareness, illiteracy, or ageism. This is a red flag that warrants further research to ensure intact cognition in illiterate elderly.

This was also noticed by, Cesar et al., 2019**;** MoCA wasn't accurate in detection of MCI in patients with a low educational level and old age and suggest decreasing the cut off point for its diagnosis to (15-19) according to education years to improve its accuracy and sensitivity [30].

Similarly, Apolinario et al., 2018 found that there was a nonlinear positive relationship between MoCA

score and educational level, so MoCA score cut off point needs to be adjusted according to educational level and age. They recommended the use of memory index score for correction of MoCA score according to age and educational level [31].

Therefore, with the increasing interest to screen for MCI rather than dementia, the appropriateness of tools regarding sensitivity and specificity in subgroups of elderly as the illiterate remains to be studied and validated. It is also important to cease the use of screening tools that have long been used, but are unable to detect MCI accurately hence missing cognitive impairment at an early stage and affecting patients and caregivers' quality of lives.

Conclusion:

There was no agreement between MoCA-B and MMSE scale grades among the studied cases. This is probably due to the low sensitivity of MMSE in screening for MCI as noticed in a lot of studies, but further studies are warranted to ensure that MoCA-B does not overestimate cognitive impairment in illiterate elderly and to ensure its efficacy in detection of MCI.

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