Relationship between Cognitive Function and the Upper Limb Function in Multiple Sclerotic Patients

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Abstract

Background: Cognitive impairment and upper limb impairment are common disabilities in multiple sclerosis patients.

Purposes: The purpose of this study was to investigate the relationship between cognitive function and the affected upper limb function in patients with M.S. Thirty M.S patients were selected from Abdullatif Jameel hospital, Dr. Soliman Fakeeh hospital and East Jeddah hospital.

Materials and methods: All patients were assessed for functional performance by the Action research arm test and cognitive function by Montreal Cognitive Assessment.

Results: The findings showed a moderate relationship between MoCA and ARAT. In contrast, there was a non-significant correlation between MoCA and age, and duration of illness.

Conclusion: There is a relationship between cognitive function and affected upper limb function in MS patients.

Key Words: Multiple Sclerosis, Upper limb function, Cognitive function.

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Introduction

Multiple sclerosis (MS) is a chronic progressive autoimmune disease that affects both white and gray matter of the central nervous system (CNS)(1). MS symptoms vary accordingly to the functional system involved including Sensorimotor impairments, incoordination, cognitive decline, and neuropsychiatric symptoms which significantly impact life satisfaction and community participation (2).

Motor and sensory dysfunction of the lower limbs in MS patients are often the first manifestations to appear so most studies focus on them (3). However, 66% of the MS population also have upper limb dysfunction (4) that affects some of the daily life activities and hinders full society participation (5,6).

Many studies reported cognitive impairment in MS as a frequent complication (7,8,9) but the prevalence can vary according to multiple factors as the sample studied and the applied cognitive Assessment tool (10).

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The cognitive impairments in MS can represent in form of memory deficits, reduced attention, and slowing of information processing that interferes with the quality of life, household activities, social interaction, as well as job retention (11,12).

**Materials and Methods**

Thirty (21 females and 9 males) MS patients at age of \((33.30 ± 1.32)\) years, recruited from Abdullatif Jameel hospital, Dr. Soliman Fakeeh hospital where they were assessed and medically diagnosed with MS (remittent and relapse type) based on careful clinical assessment and radiological investigations including computed tomography (C.T. scan) and/or magnetic resonance imaging (M.R.I.) of the brain. All participants signed a written informed consent before participation according to the IRB no. (FMRS-EC2022-032). Age, sex, and duration of illness were recorded.

Participants underwent assessments that evaluated cognitive functions and upper limb motor function. The cognitive assessment included Montreal Cognitive Assessment (MOCA) and the function of the upper extremity was evaluated through the Action research arm test (ARAT).

The Montreal Cognitive Assessment MoCA was designed to assess cognitive performance in patients with mild cognitive impairments, Alzheimer's disease, and another neurological diseases. It assesses multiple cognitive domains which include attention, concentration, executive functions, memory, language, visuospatial skills, abstraction, calculation, and orientation with a total score of 30 points (13).

The Action research arm test (ARAT) was designed to assess the upper limb functions in patients with stroke, brain injury, and multiple sclerosis. Moreover, it assesses the coordination, dexterity, and activity of daily living by observation. The ARAT is divided into four sub-tests which include grasp, grip, pinch, and gross arm movement. It consists of 19 items each item scored from 0 to 3. 0 represents an inability to complete the task and 3 to complete the task normally. The total score is calculated out of 57 possible points (14).

**Statistical Analysis**

The data were analyzed using statistical software SPSS version 21 (SPSS, Inc., Chicago, IL, USA) and Graph Pad software. Descriptive statistical analysis has been made for all variables, and all data were expressed as mean ± SD. Pearson correlation coefficient (r) was used to determine the relationship between different variables in this study. The level of significance is \(P< 0.05\).

**Results**

The baseline characteristics of the patients are shown in Table 1. Patients included 21 males and 9 female MS patients. The average age was 33.30 ± 1.32 years and the average duration of illness was 22.00 ± 3.29 months in, as shown in Table 1.

**Table (1):** General characteristics of patients, data are presented as mean ± SD or number of patients.

<table>
<thead>
<tr>
<th>Items</th>
<th>N=30 Mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>33.30 ± 1.32</td>
</tr>
<tr>
<td>Sex (female/male)</td>
<td>21(70 %)/9 (30%)</td>
</tr>
<tr>
<td>Duration of illness (Months)</td>
<td>22.00 ± 3.29</td>
</tr>
</tbody>
</table>

As shown in Table 2 the results showed a moderate correlation between Montreal Cognitive Assessment (MOCA) and the Action research arm test (ARAT) \((r = 0.66\) and \(p=0.035\)). Data were listed in table (2).

**Table (2):** Montreal Cognitive Assessment (MOCA) and Action research arm test (ARAT).

<table>
<thead>
<tr>
<th>Montreal Cognitive Assessment (MOCA)</th>
<th>r</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action research arm test (ARAT)</td>
<td>0.66</td>
<td>0.035*</td>
</tr>
</tbody>
</table>

* Significant at \(p < 0.05\).

As shown in Table 3 the results revealed non-significant correlation between Montreal Cognitive Assessment (MOCA) and age and duration of illness \((r = 0.38\) and \(p=0.28\)) and \((r = 0.38\) and \(p=0.28\)) respectively. Data were listed in table (3).

**Table (3):** Correlation between Montreal Cognitive Assessment (MOCA), Age, and Duration illness.

<table>
<thead>
<tr>
<th>MOCA</th>
<th>R</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>-0.36</td>
<td>0.29</td>
</tr>
<tr>
<td>Duration of illness</td>
<td>-0.21</td>
<td>0.57</td>
</tr>
</tbody>
</table>

* Significant at \(p < 0.05\).
Discussion

Patients with multiple sclerosis suffered physical impairments that affect their functional independence (15). However, physical problems are insufficient to explain some debilitating performance in daily life activities, especially those that require high cognitive functions (16).

The result of the present study revealed a moderate relationship between cognitive function and function of the affected upper limb evaluated by (MoCA) and (ARAT). This was similar to the work of Benedict et al, 2011 that investigated the relationship between cognitive and motor functions in patients with MS and stated that Processing speed and executive function tests significantly predicted variability in motor performance (17).

A very recent study to investigate the impact of the structural damage in patients with remitting relapse MS on their cognition and motor functions, supported the integration of both Motor and cognitive testing in clinical practice as the reduced executive functions contributed to impaired motor performance (18).

In the present study, we used the MoCA which allows for an evaluation of global cognitive performance. The MoCA is more sensitive than the mini-mental state examination MMSE in screening for cognitive deficits (19), and it has higher internal reliability (20). More importantly, the MOCA is superior to the MMSE as it is more accurate in the detection of long-term cognitive impairment including executive functioning, attention, recall, and visual construction (21, 22).

Also, the results of the present study revealed a non-significant correlation between the MoCA and age and duration of illness.

In contrast to our findings, the study by del Ser et al., 2005 found that age, polypharmacy, previous cognitive impairment, and hypotension during admission are risk factors for the progression of cognitive impairment (23).

And in contrast to the findings of the recent research that investigated the correlation between demographic characteristics and physical and cognitive functions in older multiple sclerosis patients and stated that Information processing speed and physical function are strongly correlated (24).

This opposition may be attributed to the middle-aged presentation of the recruited sample so, we furtherly recommend testing a more aged MS population.

Conclusion

It was concluded that there is a relationship between cognitive function and affected upper limb function in MS patients. Therefore, it is important to emphasize the cognitive function in a rehabilitation program for patients with multiple sclerosis.

Conflict of interest

The authors declare no conflict of interest.

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REFERENCES


