

Investigation the Cognitive Impairment in Diabetes Mellitus Type 2 with Moca Test

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Received Date: July 1, 2014, Accepted Date: September 26, 2014, Published Date: October 3, 2014

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Abstract

Objective: Type 2 diabetes mellitus (DM) is one of the most common major diseases in older adults, and its prevalence increases with age. DM not only causes somatic complications but also may lead to cognitive dysfunction. The aim of this investigation is to reveal the relationship between diabetes mellitus type 2 and cognitive impairment (CI).

Method: Over a 6-month period, a total of 15 DM (12 male and 3 female) and, 15 non- DM (12 male and 3 female) subjects were included the study. Each DM patient was matched when possible with a non- DM control subject. Information collected from other hospital records and medical notes. The Montreal Cognitive Assessment (MoCA) is a screening instrument for CI.

Results: Mean age of the study subjects was 69.9 ± 7.43 years and 6 (20%) of the study subjects were females. The prevalence of CI was 83.3% (25/30) in the whole group and 73.3% (11/15) in patients with DM, whereas it was 93.3% (14/15) in non- DM group. The mean scores were 15.53 ± 6.18 and 15.40 ± 3.99 , respectively ($p: 0.945$). There was no significant difference between diabetic and non-diabetic groups in terms of MoCA domains.

Discussion: Compared with an age- and gender-matched group of non-diabetic control subjects, this study demonstrated that no differences of prevalence for CI in an elderly group of patients with DM. CI prevalence in our study, in both DM (73.3%) and non-DM groups (93.3%) is much higher than the literature and it makes us to think that MoCA test is not appropriate for our population.

Conclusion: According to our findings, CI was similar in both groups and prevalence was not different between groups. Further studies with longitudinal designs are needed to identify the relationship between DM and CI.

Keywords: Diabetes Mellitus; Cognitive impairment; MoCA test

Introduction

Type 2 diabetes mellitus (DM) is one of the most common major diseases in older adults, and its prevalence increases with age [1,2]. Patients with DM are subjected to micro angiopathic complications as neuropathy, retinopathy, nephropathy and macro angiopathic atherosclerosis as stroke and ischemic heart disease. DM not only causes somatic complications but also may lead to cognitive dysfunction [3-8]. Several hypotheses have been suggested for a relationship between DM and cognitive impairment (CI). One of them is DM has an indirect effect on cognition via vascular disease [9]. It was reported that elderly DM patients have impaired cognition in comparison to age- matched controls [10,11]. Although cognitive dysfunction has been reported in patients with DM, there is not any specific domains of cognition that may be related by DM [3,12,13].

The aim of this investigation is to reveal the relationship between diabetes mellitus type 2 and cognitive impairment.

Material and Methods

This retrospective study was performed in Ordu University. After the study protocol was approved by the local ethical committee, over a 6-month period, a total of 15 DM (12 male and 3 female) and, 15 non-DM (12 male and 3 female) subjects were included the study. Each DM patient was matched when possible with a non- DM control subject, of the same gender and whose age was within 2 years of that of the patient. None of the control subject had a history of DM and had not been prescribed oral hypoglycaemic agents or insulin. All patients were aged 60 years or more. Information collected from other hospital records and medical notes.

The Montreal Cognitive Assessment (MoCA) is a screening instrument for CI, but MoCA has not been validated in patients with DM. The MoCA consists of 7 subscores: visuospatial/executive (5 points); naming (3 points); memory (5 points for delayed recall); attention (6 points); language (3 points); abstraction (2 points); and orientation (6 points) and upper score limit is 30. One point is added if the subject has 12 years of education. The cut-off value is determined as 21 [14,15].

Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS), Version 20. Descriptive statistics were used to summarize all measurements. All continuous data mean \pm standard

deviation. The Mann-Whitney U test and chi-square test was used for statistical comparisons. The level of statistical significance was set as $p < 0.05$.

Results

Mean age of the study subjects was 69.9 ± 7.43 years and 6 (20%) of the study subjects were females. Statistical analysis did not show significant difference between education level of two groups ($p: 0.824$). The frequency of CI was 83.3% (25/30) in the whole group and 73.3% (11/15) in patients with DM, whereas it was 93.3% (14/15) in non-DM group. The mean scores were 15.53 ± 6.18 and 15.40 ± 3.99 , respectively ($p: 0.945$). Characteristics of diabetic and non-diabetic group are shown in Table 1. There was no significant difference between diabetic and non-diabetic groups in terms of MoCA domains Table 2.

	DM	Non-DM	p
Gender (M/F)	12/3	12/3	1
Age	71.27 ± 8.57	69.20 ± 5.06	0.428
Education state	0	1	0.824
none			
literate	4	5	
elementary school	8	7	
middle school	1	1	
high school	1	0	
college	1	1	
CI	11	14	0.142
MoCA Score	15.53 ± 6.18	15.40 ± 3.99	0.945

Table 1: Characteristics of diabetic and non-diabetic group and comparison of cognitive state in both.

MoCA domain	DM	Non-DM	p
Visuospatial /Executive	1.80 ± 1.17	1.80 ± 1.56	1
Attention	3.40 ± 2.02	2.60 ± 1.50	0.230
Language	1.33 ± 0.82	1.33 ± 0.82	0.512
Abstraction	1.27 ± 0.79	0.86 ± 0.80	0.135
Delayed recall	1.60 ± 1.08	1.31 ± 1.1	0.387
Orientation	4.87 ± 1.46	5.13 ± 1.19	0.587

Table 2: Scores and comparison of MoCA domains of diabetic and non-diabetic group.

Discussion

In the present study, we investigated factors associated with CI in elderly DM subjects using MoCA. Compared with an age- and gender-matched group of non-diabetic control subjects, this study

demonstrated that no differences of frequency for CI in an elderly group of patients with DM.

In previous studies, controversial results have been stated for the DM as a risk for CI. Although some of the studies have found a relationship between DM and CI, others have reported no relationship [4-8,16]. Katzman et al. found an association between DM and dementia [17]. Contrary, in a cross-sectional study conducted by Croxson et al. did not find a significant difference [18]. In another study, authors concluded that, borderline diabetes increases risks of dementia [19]. In our study, regardless of a small number of participants and a different method and scale in determination of CI, we did not found a different frequency of CI in diabetic group.

Prevalence of CI in DM ranging from 20% to 38% [20-22]. In a population-based study, CI in patients with DM was reported as 28% [20]. CI frequency in our study, in both DM (73.3%) and non-DM groups (93.3%) is much higher than the literature and it makes us to think that MoCA test is not appropriate for our population or we have made mistakes in patient selection. It should be related to lower educational state of our patients and the absence of the MoCA test form for untrained people. Also, cause of retrospective design of the study, none of the control subject's brain imaging was evaluated. So, we cannot say that our control group was entirely healthy people. On the other hand, other etiological factors might be interacted to our results. We did not, therefore, examine all possible factors which may have effect on CI. We also did not specifically examine the unrecognized depression or DM and medication. Moreover, we did not question the past history of intellectual ability, which may have implications for evaluating the cognition.

Main limitation of our study is small sample size. The other limitations of our study are not excluding the metabolic and the structural conditions were not excluded. Maybe, we should have investigated the routine blood tests and neuroimaging to find the other causes of CI.

In the present study we evaluated the effect of DM on CI. We compared frequency of CI in diabetic and non-diabetic group, matched in age, sex and educational state. According to our findings, CI was similar in both groups and frequency was not different between groups. Further studies with longitudinal designs are needed to identify the relationship between DM and CI.

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