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Assessment of Cognitive Functions in Iron Defficiency Anemia with Montreal Cognitive Assesment

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ABSTRACT

There is growing evidence for cognitive dysfunction in iron deficiency anemia (IDA). The aim of the present study was to assess cognitive performance in IDA patients with Montreal Cognitive Assesment (MoCA). A study including 40 patients with iron defficiency anemia our hospital was conducted cognitive assessment with MoCA and laboratory analysis including blood count, iron, total iron binding capacity, ferritin, and transferrin saturation were performed. Univariate and multivariate analyses were performed to determine the variables associated with MoCA score. The mean MoCA score ± SD was 23,73 ± 4,00 (range 11–30). Iron (r=0.37, p<0.01) , transferrin saturation (r=0.42, p<0.007) and ferritin (r=0,56 , p< 0,001) were significantly correlated with MoCA score. Hb and TIBC did not show a correlation with MoCA scores. In conclusion, the results of our study supported patient of IDA is significantly associated with increased risks of reduce in cognitive function by MoCA test. Effective identification of this trouble allows adequate psychological interventions to improve the quality of life of IDA.

Introduction

Iron Deficiency Anaemia (IDA) has been shown to be the most common cause of anaemia worldwide (1). Anemia is a debilitating condition that commonly causes tiredness, lethargy, and dyspnea, and often signals more serious health problems. Bununla birlikte Anemia is associated with cognitive impairment. Compared with nonanemic individuals, anemic patients have a higher risk of cognitive impairment (2,3). Deficiency of iron, which plays an important role in oxygen transport and storage, may lead to cerebral hypoxia and cognitive decline (4). The Montreal Cognitive Assessment (MoCA) is a novel international brief cognitive screening tool developed for the detection of cognitive dysfunction (5). Recent studies showed that the MoCA was more sensitive to mild cognitive impairment than the Mini-Mental State Examination (MMSE) (6,7). The aim of the present study was to assess cognitive performance in IDA patients with Montreal Cognitive Assesment (MoCA).

Material and Methods

A study including 40 patients with iron defficiency anemia our hospital was conducted. All patients enrolled in the voluntary consent. The relationship between cognitive dysfunction and IDA was analysed by univariate and multivariate analysis. Cognitive assessment with MoCA and laboratory analysis including blood count, iron, total iron binding capacity, ferritin, and transferrin saturation were performed.

Blood samples were obtained by venipuncture from the antecubital vein after 12 hours fast. Laboratory analysis for total blood count, plasma iron, total iron binding capacity (TIBC) and ferritin levels were performed. Turbidimetric immunoassay (The beckman IMMAGE FER Test) was used for the determination of ferritin levels. Transferrin saturation was calculated by the classical formula (plasma iron/TIBC × 100). Anemia diagnosis was made according to WHO criteria (Hb<12g/dl for women, <13g/dl for men). Patients with transferrin saturation lower than 15% or ferritin level lower than 15ng/ml were diagnosed as IDA.

Patients were screened for cognitive impairment using the Turkish version of MOCA test (8). The MoCA total score and 8 cognitive cognitive domain scores were used in this secondary analysis. MoCA has a total scoring range of 0 to 30. A score of 26 to 30 is considered normal, 22 to 25 is considered mild cognitive impairment, 17 to 21 is considered moderate cognitive impairment, and a score below 17 is considered dementia.

Patients were excluded from the study on the following basis: neurocognitive problems documented in the medical history (cerebral vascular accident, transitional ischemic attack, short-term memory loss, confusion, delirium, or dementia); and inability to answer questionnaires independently due to language barriers or visual acuity.

Multivariate regression analyses were performed in order to find out the independent effect of iron deficiency on moCA scores. For conducting the statistical analysis SPSS 15.0 for Windows was used and a p value <0.05 was considered as statistically significant.

Results

Table 1 summarizes demographic, laboratory results and MoCA test for patients with IDA The mean MoCA score ± SD was 23,73 ± 4,00 (range 11–30). Correlation analysis between MoCA scores and iron parameters including iron, total iron binding capacity(TIBC), transferrin saturation, ferritin, and hemoglobin (Hb) were performed. Results revealed that iron (r=0.37, p<0.01) , transferrin saturation (r=0.42, p<0.007) and ferritin (r=0,56 , p< 0,001) were moderately and significantly correlated with MoCA score. Hb and TIBC did not show a correlation with MoCA scores.

Table 1. Demographic and MoCA test score of patients with IDA (n = 40)

Male gender Female gender	3(7,5%) 37 (92,5%)
Age (years) (range)	34,65 (18-65)
Education (years) 5 year 6-12 year >13 year	 12(30%) 8(20%) 20(50%)
MoCA score (range)	23,75±4,00 (11-30)

Discussion

The results of this study revealed a significant decrease in cognitive function in patients with IDA. MoCA test scores were significantly lower in patients with IDA. This study is the first to examine the relationship between iron status and assesment cognitive function with MoCA test in the IDA.

Mild Cognitive Impairment (MCI) is considered a transitional stage between normal cognitive aging and impaired cognition caused by several pathologies such as the history of coronary heart diseases, stroke and anaemia were independent risk factors of MCI (3).

The cognitive impairment was performed by miscellaneous tests at a variety of disease including systolic and diastolic heart failure , Alzheimer disease , Huntington disease , Parkinson dis-

ease and systemic lupus erythematosus (SLE) (9,10,11,12,13). In the literature, we don't find out a study of iron deficiency anemia associated cognitive impairment assessed by MOCA.

According to the World Health Organization, iron deficiency (ID) is the most prevalent nutritional deficiency (14). Iron deficiency anemia, the most common form of anemia, has been suggested to result in cognitive deterioration and alteration of neurological functions (15). The Montreal Cognitive Assessment (MoCA) was developed as a screening tool for mild cognitive impairment (MCI) (12). Because of the MoCA was more sensitive to mild cognitive impairment than the MMSE (6) that MoCA test was performed for this study. Our study showed that iron (r=0.37, p<0.01) , transferrin saturation (r=0.42, p<0.007) and ferritin (r=0,56 , p< 0,001) were significantly correlated with MoCA score.

Iron is an essential component of hemoglobin, myoglobin, and many enzymes in cellular metabolism and DNA replication and repair. It also plays a crucial role in the development of the central neurological system Chronic deficiency of iron, which plays an important role in oxygen transport and storage, could lead to cerebral hypoxia and cognitive decline (15,16).

The limitations of this study are that the correlation of MoCA and MMSE were not evaluated and the number of patients was relatively small.

In conclusion, the results of our study supported patient of IDA is significantly associated with increased risks of reduce in cognitive function by MoCA test. However, a large series of prospective studies are needed on this subject.

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