Original Article

Influence of Chronic Disease on Cognitive Functions of Patients

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Abstract

Background: It is known that cognitive functions can be disrupted with advancing age but the studies that are conducted reveal that various pathological processes such as chronic diseases.
Objective: To examine the influence of chronic disease on cognitive functions of patients.
Methodology: The cross-sectional design was used. The research was carried out in the polyclinic of university hospital with 243 patients. Data were collected through face-to-face interviews with the scale of Montreal Cognitive Assessment (MoCA).
Results: As per the research outcomes, MoCA scale score average was determined as 23.93 ± 2.97. As per the statistical analysis being made, statistically meaningful difference was found between cognitive levels of participants as per their situations relating with age, education status, children status, chronic diseases, and continuous usage of medicines It has been found that cognitive functions of individuals with chronic disease are worse.
Conclusion: It is recommended that cognitive function assessments should be made in different chronic diseases due to the impairment of cognitive function of chronic diseases.

Keywords: Cognitive function, chronic disease, montreal cognitive assessment scale (MoCA)

Introduction

Cognition includes advanced mental processes such as attention, perception, memory, language development, reading and writing, problem solving, remembering, thinking, intellect, and creativity. Cognitive development is a development area which includes stages of obtaining, using, storing, interpreting and rearranging, and evaluating the information which enable interaction with the environment and for the environment to be understood starting from the time of birth. With the help of these functions, a person gets aware of his situation, needs, targets, and actions that are required for these targets and he can continue with his life in an appropriate way (Gulum & Dag, 2012). It is known that cognitive functions can be disrupted with advancing age but the studies that are conducted reveal that various pathological processes such as smoking, lack of nutrition, Parkinson, diabetics, multiple sclerosis, and paralysis can also influence cognitive functions (Alagiakrishman, Zhao, Mereu, Senior & Senthilselvan, 2013; Anstey, Sanden, Salim & O'Kearney, 2007; Freitas, Simoes, Alves & Santana, 2011; Gulec, et al., 2017; Moreas, et al., 2010; Ozdilek & Kenangil, 2014; Sweet et al., 2011).

As a result it is known that chronic diseases have negative impact on cognitive functions.Evaluation of cognitive situation and early detection of changes bear significant importance for reducing dependency levels of individuals having chronic diseases, for taking necessary measures, and for improving life quality (Lam, et al., 2013; Nasreddine et al., 2005). The purpose of this study is to determine cognitive functions of individuals having or not having chronic diseases, to define the problems early and to direct for treatment, to make contribution to literature by evaluating memory health of individuals, and to form basis for

randomized controlled experimental works that will be planned in this area in the future.

Methodology

The cross-sectional and descriptive design was used. The research was carried out in the polyclinic of a university hospital between January 2017 and March 2018. Convenience sampling methods were used. Twenty five patients refused to participate (10.2%). The study sample consisted of 243 patients. The inclusion criteria for patients were a person who voluntarily accepted participation in the research, was literate in Turkish, had no hearing or speaking impairment, was 18 years and older. Factors that disqualified patients from sampling were their diagnosis with any psychiatric and neurological disease, brain surgery and alcohol-drug addiction.

Instruments

Demographic characteristics: This form is comprised of nine questions regarding patients' sociodemographic characteristics: age, sex, marital status, educational status, income status, having children, smoking, have chronic illness and use drugs continuously.

Montreal Cognitive Assessment (MoCA): The MoCA is a screening instrument and assesses eight different cognitive domains that include attention and concentration, executive function, memory, language, visual/ constructional skills, conceptual thinking, calculations, and orientation. Although all sections are brief, each contains items selected from longer psychometric instruments. The maximum possible score is 30 points. Montreal Cognitive Assessment (MoCA) was developed by Nasreddine et al. (2005) The adaptation, reliability and validity studies of the scale in Turkey were already available (Selekler, Cangöz & Uluç, 2010). Using a cut-off score of 21 of 30. Internal consistency using Cronbach's was .66. In this study, the reliability coefficient of the scale was determined as 0.68.

Statistical Analysis: Analysis was conducted using descriptive statistics tests using the Statistical Package for the Social Services SPSS 22.0 (SPSS Inc., Chicago, IL). Descriptive statistics were used to determine patients' characteristics. A test of hypothesis with p value of < 0.05 was considered significant.

Ethical Considerations: This study was approved by the Institutional Review Board of the University (IRB approval number: GO 2016/29). Institutional permissions were obtained in order to carry out the study. The objective of the research was explained to the participants and written permission was received from those agreeing to participate in the research. Data was collected through face-to-face interviews to help increase the accuracy of the collected information.

Results

It was found out that 54.9% of participants who are taken within the scope of research were women, 39,1% of them were university graduates, 63.6 of them were married, income of 50,6% of them was less than their expenses, 58.9% of them had children, 58.1% of them did not have chronic diseases, 59.7% of them did not use medicines continuously, and that 63.1% of them did not smoke.

As per the research outcomes, MoCA scale score average was determined as 23.93 ± 2.97. Visual evaluation sub-dimension score average was found to be 4.18 ± 0.81; naming sub-dimension was found as 2.69 ± 0.47; attention sub-dimension was found as 4.70 ± 1.31; language sub-dimension was found as 2.43 ± 0.58; abstract thinking sub-dimension was found as 1.56 ± 0.60; delayed memory sub-dimension was found as 2.81 ± 1.32; orientation sub-dimension was found as 5.47 ± 0.67. (Table 1). As per the statistical analysis being made, statistically meaningful difference was found between cognitive levels of participants as per their situations relating with age, education status, children status, chronic diseases, and continuous usage of medicines (p < 0.05). Furthermore, no differences were found between the groups according to gender, income status and smoking situation of participants (p > 0.05). (Table 2).When sub-dimensions of cognitive level are investigated as per existence of chronic diseases, it was found out that score averages of individuals not having chronic diseases were higher in the areas of naming, attention and orientation and that there were no differences between the groups (p < 0.05). Besides, no meaningful differences were found between groups in the sub-dimensions of language, abstract thinking and delayed memory being among the sub-dimensions of cognitive function (p > 0.05). (Table 3).

Table 1. Scores of montreal cognitive assessment (MoCA) scale

	Min-Max	$\overline{X} \pm SD$
Executive Functions	0-5	4.18 ± 0.81
Visuoconstructional Skills	1-4	2.69 ± 0.47
Attention And Concentration	1-6	4.70 ± 1.31
Language	1-3	2.43 ± 0.58
Conceptual Thinking	0-3	1.56 ± 0.60
Memory	0-5	2.81 ± 1.32
Orientation	3-6	5.47 ± 0.67
MoCA Total Scale	13-30	23.93 ± 2.97

Table 2. Comparison of the montreal cognitive assessment scale point averages according to individual characteristics and clinical characteristics of patients

	n	%	MoCA $\overline{X} \pm SD$	Statistical Analysis
Age				
18-29	71	28.1	25.49 ± 2.44	F= 26.200
30-44	97	38.3	24.28 ± 2.51	P=0.000
45-59	69	27.3	22.75 ± 2.79	
60 and above	16	6.3	19.93 ± 3.10	
Gender				t=0.29
Female	139	54.9	23.92 ± 3.23	p=0.977
Male	114	45.1	23.93 ± 2.64	
Educational level				
Primary	33	13.0	20.93 ± 3.42	F= 18.780
Secondary	56	22.1	23.75 ± 2.25	P=0.000
High School	65	25.7	23.96 ± 2.69	
University	99	39.1	25.01 ± 2.67	
Marital status				
Married	161	63.6	23.05 ± 2.95	t= -7.15
Single	92	36.4	25.46 ± 2.33	p= 0.000
Economic status				
Income < expense	128	50.6	23.99 ± 2.77	F= 1.167
Income = expense	87	34.4	23.60 ± 3.41	P= 0.313
Income > expense	38	15.0	24.47 ± 2.51	
Children				
Have	149	58.9	23.02 ± 2.98	t = - 6.260
Have not	104	41.1	25.24 ± 0.23	p= 0.000
Chronic disease				
Have	106	41.9	22.98 ± 2.78	t = - 4.51
Have not	147	58.1	24.61 ± 2.93	p= 0.000
Continuous Drug Use Status				
Yes	102	40.3	22.94 ± 2.76	t= -4.57
No	151	59.7	24.60 ± 2.94	P= 0.00
Smoking			24.36 ± 2.54	
Have	96	37.9	23.67 ± 3.20	t = 1.81
Have not	156	63.1		p= 0.62

Table 3. Comparing patients' montreal cognitive assessment mean score based on chronic disease

		Chronic disease Have (n=106) M ± SD	Chronic disease Have not (n=147) M ± SD	Statistical Analysis
M1	**Executive Functions**	3.89 ± 0.83	4.39 ± 0.76	t= -4.914 **p=.000***
M2	**Visuoconstructional Skills**	2.59 ± 0.53	2.77 ± 0.41	t= -3.033 **p=.003***
M3	**Attention And Concentration**	4.40 ± 1.00	4.92 ± 1.17	t=-3.694 **p=.000***
M4	**Language**	2.36 ± 0.62	2.48 ± 0.55	t= -1.640 p=.102
M5	**Conceptual Thinking**	1.50 ± 0.62	1.61 ± 0.59	t= -1.337 p=.182
M6	**Memory**	2.78 ± 1.12	2.82 ± 1.45	t=-.277 p=.782
M7	**Orientation**	5.37 ± 0.70	5.55 ± 0.64	t= -2.029 **p=.044**
Total Scale		22.98 ± 2.78	24.61 ± 2.93	t= -4.475 **p=.000***

*p<0.05

Discussion

Cognitive functions are important for individuals to continue with their lives in an effective way, whether they are healthy or are diseased. The studies being conducted have revealed that cognitive functions are negatively influenced in the situation of various chronic diseases. In this respect, number of researches in which cognitive functions in Turkish community are investigated are limited. Aksoy et al (2013) have compared cognitive functions of diseases being diagnosed with multiple sclerosis and cognitive functions of healthy individuals and they have determined that cognitive functions of individuals having chronic diseases were worse when compared with those of health individuals. In our research it was found out that cognitive functions of individuals having chronic diseases were worse than those not having them. According to the study that are conducted, it is seen that chronic diseases have negative impact on cognitive

functions (Yanardag, et al., 2018). In a research that was conducted on old individuals, cognitive level of individuals having chronic diseases and especially hypertension was found to be lower than that of others (Yanardag, Tarsuslu Şimşek & Çamursoy, 2018). In the study conducted by Ak, et al. (2015) in which cognitive function level of individuals having chronic kidney deficiency and that of health individuals were compared, it was found out that ratio of cognitive disfunction ratio in patients having chronic kidney deficiency (24.6%) was much higher when compared with healthy cases. In the study conducted by Ulaslı et al. (2013) determined that cognitive functions of group having chronic diseases were lower than those of the group not having chronic diseases and that there was meaningful difference between the groups (p< 0.001). In our study it was found out that cognitive levels of individuals having chronic diseases were lower than those not having them. When sub-dimensions of cognitive levels were

investigated, it was found out that score averages of individuals not having chronic diseases were higher in the areas of naming, attention and orientation. It is considered that chronic diseases had more impact on these areas with respect to the evaluation of cognitive functions. In that respect our outcome supports the literature information.

According to our research a meaningful difference was found between the age groups with respect to cognitive functions and it was determined that as the ages increased, score averages got reduced and that cognitive functions were diminished. Age is the most important risk factor for cognitive worsening (Yanardag, et al., 2018; Freitas, et al., 2012). In a study being conducted it was determined that cognitive functions of elderly people staying at eventide homes were disrupted with their advancing ages and that age group with lowest scale score was between 75-94 (Esenegen et al., 2000). In another study it was observed that cognitive function values of individuals in the age interval of 75–88 were lower than those of individuals under the age of 75 (Onat, 2013). In another study being conducted, while MoCA scale score average was found as 12 for individuals with ages over 60, it was found to be 10 for individuals with ages over 80 (Yanardag, et al., 2018). In our study reduction of score with the increasing of age reveal that cognitive functions are getting worse and in that respect it supports the literature.

According to the outcome of our research, no differences were determined in cognitive functions with respect to gender types. Effect of gender on cognitive functions should be discussed. When literature is investigated, there are researches revealing that cognitive functions of women are better and on the other hand, there are researches revealing that cognitive functions of men are better (Freitas, Simones, Alves & Santana, 2012; Cetin, Kara & Kitis, 2014). In certain studies being conducted it was found out that gender did not influence cognitive functions (Onat, 2013). It is considered that gender is not a determining factor on cognitive functions for Turkish community.

As a result of our research it was found out that as education level increased, cognitive functions were increased. Education status is defined as an important scale for determining cognitive functions (Moreas, et al., 2010; Freitas, et al., 2012; Demir Akca, et al., 2014). In the study being conducted it was found out that as education level decreased, cognitive functions were reduced (Aksoy, et al., 2013). According to the outcome of our research, as education level increased, it was found out that the score increased. Increase in education level enable for cognitive functions to be continuously used with respect to improving oneself and learning new things. It is considered that as individuals having high education levels used their cognitive functions more effectively and for a long time, the scores increased.

In our study it was found out that cognitive functions of single individuals were higher. In the studies being conducted it was determined that there was difference between elderly people with respect to their marital status. It was found out that cognitive functions of married group were better. It is considered that being married enabled for more socialization and continuity of communication in elderly people (Moreas, et al., 2010; Demir Akca, et al., 2014). However as age average is lower in our study, it is thought that social activities, interactions and contacts of single individuals are more dense and that their cognitive functions are better in return. For this reason it is considered that the difference was found to be meaningful. Another reason of occurrence of the difference could be the difference between married and single individual samples. It is thought that as number of group individuals are not similar, differences could arise.

Outcome of our research reveal that there is no difference between the groups as ger income levels. When literature is investigated, there are studies in which a relationship was found between socioeconomic status and cognitive situation. It was determined that one of the reasons of this relationship is that those having high socioeconomic levels can reach health care much easier (Moreas, et al., 2010;. Yanardag, et al., 2018). Outcome of our research does not comply with literature information. It is thought that in our research there are other factors influencing cognitive situation of participants. Another reason why there are no differences between groups could be that there is no homogeneous distribution and that sample numbers of groups are different. The fact that income status of 50.6% of individuals

participating in our study is equal to their expenses status, creates difference between the groups.

As a result of our study it was determined that cognitive functions of individuals who are continuously using medicines were lower than those of individuals not using them. Usage of medicines can cause undesired effects such as toxic impacts in the body or increase in free oxygen radicals, besides treating the disease. As a result of these effects, there can be a reduction in cognitive functions. Medicines that are used can have negative effects on cognitive functions (Yanardag, et al., 2018). In a study was determined that number of medicines which the patients used continuously did not create any differences with respect to cognitive functions (Demir Akca et al., 2014). In our study number of medicines being used was not questioned and only continuous usage of medicines was questioned. In that respect it is thought that individuals having chronic diseases will use medicines continuously and that this will have negative influence on cognitive functions.

As a result of our study it is seen that cognitive function situation of individuals who are smoking is lower than that of those who are not smoking. Smoking can cause reduction in cognitive functions. Nicotine which is present in the cigarettes has negative impact on various neurotransmitter systems. As relating with this, various cognitive areas such as sensual, motor, attention, executive function, learning, and memory are being negatively influenced (Anstey, Sanden, Salim & O'Kearney, 2007; Gulec, et al., 2017; Ott, et al., 2004). In a cohort study with multi-centers, they have found out cognitive functions of individuals being subject to higher number of cigarette packages per year were lower (Ott, et al., 2004). In a meta-analysis which they conducted, Anstey et al. (2007) have stated that in individuals who were smoking dementia and cognitive deterioration risk were increased. In that respect the outcome of our study supports the literature.

Conclusion

In individuals having chronic diseases, cognitive function disorder is an important risk factor. In a group with a specific chronic disease, it is recommended for cognitive functions to be evaluated and for measures to be taken as being specific for the disease, regularly monitoring the cognitive functions of individuals having chronic diseases, and using MoCA scale in these observations.

References

Ak R, Ustundag S, Ustundag A, Guldiken B, Sut N. (2015) Cognitive Dysfunction in Chronic Renal Disease: Impact of Dialysis Modality. Turk Neph Dial Transpl 24 (3): 283-293.

Aksoy S, Timer E, Mumcu S, Akgün M, Kıvrak E, Necioglu Örken D. (2013) Screening of Cognitive Influence in Multiple Sclerosis with MoCA Scale. Turkish Journal of Neurology 19: 52-55.

Alagiakrishnan K, Zhao, N, Mereu L, Senior P, Senthilselvan A. (2013) Montreal cognitive assessment is superior to standardized mini-mental status exam in detecting mild cognitive impairment in the middle-aged and elderly patients with type 2 diabetes mellitus. BioMed Research International 1:1-5.

Anstey KJ, Sanden C, Salim A, O'Kearney R. (2007) Smoking as a Risk Factor for Dementia and Cognitive Decline: A Meta-Analysis of Prospective Studies. American Journal of Epidemiology 166: 367–378.

Cetin SY, Kara İG, Kitis A. (2014) Examination of factors affecting social participation in the elderly living at home. Journal of Ergotherapy and Rehabilitation 2(1): 11–20.

Demir Akca S, Saraclı O, Emre U, Atasoy N, Gudul S, Ozen Barut B. (2014) Daily life activities of cognitive functions in elderly hospitalized patients, depression, anxiety and relationship with clinical variables. Archives Of Neuropsychiatry 51: 267-274.

Esengen S, Seckin U, Borman P, Bodur H, Gokce Kutsal Y, Yucel M. (2000) Functional cognitive evaluation and drug use in a group of elderly who live in a nursing home. Journal of Turkish Geriatrics 3: 6–10.

Freitas S, Simoes MR, Alves L, Santana I. (2011) Montreal Cognitive Assessment (MoCA): Normative study for the Portuguese population. Journal of Clinical and Experimental Neuropsychology 33: 989–996.

Freitas S, Simoes MR, Alves L, Santana I. (2012) Montreal Cognitive Assessment: influence of sociodemographic and health variables. Arch Clin Neuropsychol 27:165-75.

Gulec G, Akarsu O, Sahin FM, Essizoglu A, Kosger F, Sezer E, Sonkurt HO. (2017) The effect of chronic smoking on cognitive function. Turkish Journal of Psychiatry 28: 1-8.

Gulum V, Dag I. (2012) The Turkish adaptation, validity and reliability study of the Repetitive Thinking Questionnaire and the Cognitive

Flexibility Inventory. Anatolian Journal of Psychiatry 13:216-223

Lam B, Middleton LE, Masellis M, Stuss DT, Harry RD, Kiss A, Black SE. (2013) Criterion and convergent validity of the montreal cognitive assessment with screening and standardized neuropsychological testing. Journal of the American Geriatrics Society 61(12): 2181–2185.

Moraes C, Pinto JA, Lopes MA, Litvoc J, Bottino CM. (2010) Impact of sociodemographic and health variables on Mini-Mental State Examination in a community-based sample of older people. European Archives of Psychiatry and Clinical Neuroscience 260: 535-542.

Nasreddine ZS, Phillips NA, Bedirian V, Charbonneau S, Whitehead V, Collin I. (2005) The Montreal Cognitive Assessment, MoCA: A brief screening tool for mild cognitive impairment. Journal of the American Geriatrics Society. 53(4): 695–699.

Onat SS. (2013) The effect of sociodemographic features and cognitive functions on quality of life in elderly individuals. Turkish Journal of Osteoporosis 19: 69–73.

Ott A, Andersen K, Dewey ME, Letenneur L. Brayne C, Copeland JRM, Dartigues JF, Kragh–Sorense, P, Lobo A, Martinez–Lage JM, Stijnen T, Hofman A, Launer LJ. (2004). Effect of smoking on global cognitive function in nondemented elderly. Neurology 62(6): 920-4.

Ozdilek B, & Kenangil G. (2014) Validation of the Turkish Version of the Montreal Cognitive Assessment Scale (MoCA-TR) in patients with Parkinson's disease. The Clinical Neuropsychologist 28: 333–43.

Selekler K, Cangoz B, & Uluc S. (2010) Assessment of the ability of the Montreal Cognitive depersonalization scale (MOBID) to distinguish patients with mild cognitive impairments and Alzheimer's disease. Turkish Journal of Geriatrics 13(3): 166–171.

Sweet L, Van Adel M, Metcalf V, Wright L, Harley A, Leiva R, & Taler V. (2011) The Montreal Cognitive Assessment (MoCA) in geriatric rehabilitation: psychometric properties and association with rehabilitation outcomes. Int Psychogeriatr 23(10): 1582– 90.

Ulaslı SS, Oruc S, Gunay E, Aktas O, Akar O, Koyuncu T, Unlu M. (2013) Effects of COPD on cognitive functions: A case control study. Tuberk Toraks 61(3): 193-199.

Yanardag M, Tarsuslu Simsek T, Camursoy T. (2018) Investigation of the relationship between age and other socio-demographic characteristics and cognitive functions in individuals living in nursing home. Physical Medicine and Rehabilitation 9(4): 449-454.