

Cognitive Function in Patients with Type 2 Diabetes Mellitus

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Abstract

Introduction: The increasing prevalence of diabetes over the world has become an important public health issue. It is considered as an independent risk factor for cognitive impairment. The cognitive function of patients with type 2 diabetes mellitus is usually not assessed in routine checkup.

Objectives: To evaluate the cognitive status and associated factors of type 2 diabetes mellitus patients.

Materials and Methods: This cross-sectional study conducted in Combined Military Hospital, Dhaka from July 2014 to June 2015. A total of 191 type 2 diabetes mellitus patients were studied to find out the association between glycemic status and cognitive capacity among the patients. Cognitive capacity was assessed by using MMSE scale. Data were collected by face to face interview with a semi-structured questionnaire and checklist following systematic random sampling technique.

Results: Out of 191 patients 85.3% of the patients had uncontrolled DM but 88% of the patients had normal level of cognitive capacity and only 12% having border line cognitive capacity. More male (16.0%) than female (7.1%) patients had border line cognitive capacity. Statistically significant ($p < 0.05$) association was found with age group and glycemic status, aged group has more uncontrolled diabetes mellitus. Majority (39.4%) of elderly patients (61-80 years) had border line cognitive capacity while most (96.4%) of the younger patients (41-50 years) had normal cognitive capacity.

Conclusion: In this study type 2 DM patients found with decline in cognitive capacity. So, patients with type 2 DM should be regularly assessed for their cognitive function.

Key-words: Glycemic status, Cognitive capacity, MMSE scale.

Introduction

Cognitive function is the total amount of information the brain is capable of retaining at any particular moment. How much of one's cognitive capacity is being used towards a particular task at any given time is called the cognitive load¹. Although diabetes is considered to be risk factor for cognitive impairment, the cognitive function of patients with type 2 diabetes is not usually evaluated in routine clinical care. Cognitive impairment might be another factor associated with poor diabetes control². Type 2 diabetes mellitus and dementia are common in the elderly, which are often progressive and disabling conditions¹. As cognitive dysfunction is

highly prevalent in type 2 diabetes mellitus, the routine screening of cognitive function by FMMSE (Folstein Mini Mental Status Examination) scales should be done to find out the cognitive capacity of all type 2 diabetes mellitus patients³.

Type 2 diabetes mellitus is significantly more among the senior citizens of Bangladesh and the number is rapidly increasing. As cognitive function is closely associated with type 2 diabetes mellitus, so the probability of developing cognitive impairment is also increasing day by day among elderly patients. In Bangladesh, no study was conducted on cognitive function among type 2 diabetes mellitus patients. So, the present study was designed to find out the cognitive function status in elderly diabetic patients.

Materials and Methods

This descriptive cross sectional study was conducted among the type 2 diabetes mellitus patient reported to CMH Dhaka from July 2014 to June 2015. A total of 191 patients were interviewed face to face by using pretested semi structured questionnaire. The study subjects were selected following systematic random sampling technique. Usual introduction of the researcher and the purpose of the study were explained clearly to the respondents. Data on cognitive function were collected by using FMMSE scale³ and other data were collected by review in medical documents. After collection of data it was checked, verified and edited for consistency and statistical analysis were done by SPSS 17.0 for Windows.

Results

Mean age of the 191 respondents was 48.28 ± 12.565 years and ranging from 20 to 70 years. Mean monthly family income was Taka 25089.87 ± 15313.152 while the range was 5000-90000 Taka and majority 101 (52.9%) had monthly family income 6000-20000 Taka (Table-I). Glycemic status of patients with different laboratory test are shown in Table-II. About 64 (33.5%) patients developed complications of diabetes mellitus while 127 (66.5%) didn't develop any complications (Figure-1). Regarding cognitive function 168 (88%) were found having normal level of cognitive capacity and 23 (12%) were found having border line cognitive capacity (Figure-2). Statistically significant ($p < 0.05$) association was found with age group and glycemic status, aged group has more uncontrolled diabetes mellitus (Table-II). Overall glycemic status found 28 (14.7%) patients having controlled and 163 (85.3%) having uncontrolled glycemic status but all 33 (100%) patients of over 60 years of age had uncontrolled glycemic status and patients glycemic status was significantly ($p < 0.05$) associated with age group (Table-III). Significant ($p < 0.05$) association was

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found between patients cognitive capacity with age group and monthly family income but glycemic status and existence of diabetic complications had no significant ($p>0.05$) association (Table-IV).

Table-I: Distribution of the patients by age and monthly family income (n=191)

Characteristics		Frequency	Percentage
Age in years	20-30	22	11.5
	31-40	31	16.2
	41-50	55	28.8
	51-60	50	26.2
	61-70	29	15.2
	71-80	04	2.1
	Total	191	100.0
	Mean±SD = 48.28±12.56		
Monthly family income	6000-20000	101	52.9
	21000-35000	58	30.5
	36000-50000	20	10.4
	51000-60000	12	6.2
	Total	191	100.0
Mean±SD = 25089.87±15313.152			

Table-II: Patients glycemic status by different laboratory status (n=191)

Laboratory test	Glycemic status	
	Controlled	Uncontrolled
Fasting blood sugar	36(18.8)	155(81.2)
2 hours after blood sugar	45(23.6)	146(76.4)
HbA1C	28(14.7)	163(85.3)

• Number in parenthesis is percentage

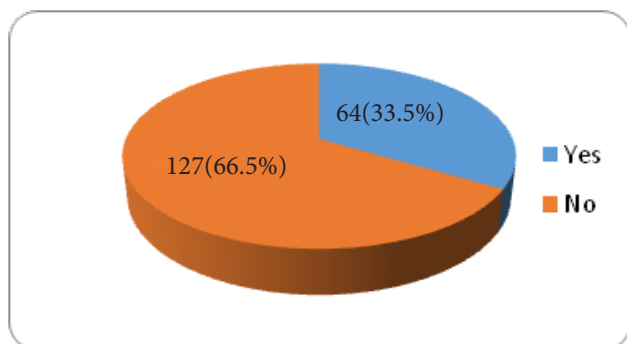


Figure-1: Distribution of the patients by complications of diabetes mellitus

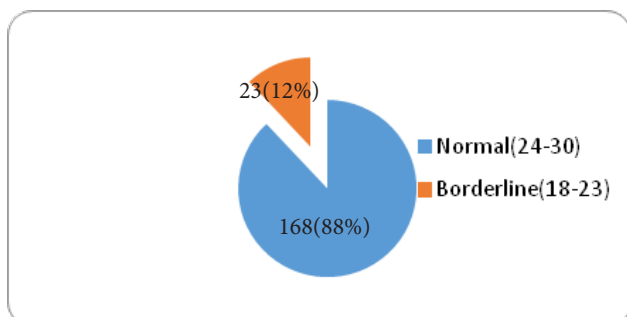


Figure-2: Distribution of the patients by level of cognitive capacity

Table-III: Glycemic status by age of the patients

Age Group (Years)	Glycemic status		Statistics
	Controlled	Uncontrolled	
20-30	7(31.8)	15(68.2)	$\chi^2= 9.003$ df= 4 $p>0.05$
31-40	6(19.4)	25(80.6)	
41-50	8(14.5)	47(85.5)	
51-60	7(14.0)	43(86.0)	
61-80	00(0.0)	33(100.0)	
Total	28(14.7)	163(85.3)	

• Number in parenthesis is percentage

Table-IV: Distribution of cognitive capacity by glycemic status of the patients

Characteristics		Level of cognitive capacity		Statistics
		Normal	Border line	
Glycemic status	Controlled	25 (89.3)	03 (10.7)	$\chi^2= 0.054$ df=1 $p>0.05$
	Uncontrolled	143 (87.7)	20(12.3)	
	Total	168 (88.0)	23 (12.0)	
Complication	No	115(89.8)	13(10.2)	$\chi^2= 1.303$ df=1 $p>0.05$
	Yes	53(84.1)	10(15.9)	
	Total	168(88.0)	23(12.0)	
Age Group (Years)	20-30	21(95.5)	1(4.5)	$\chi^2= 29.079$ df=4 $p<0.001$
	31-40	28(90.3)	3(9.7)	
	41-50	53(96.4)	2(3.6)	
	51-60	46(92.0)	4(8.0)	
	61-80	20(60.6)	13(39.4)	
	Total	168(88.0)	23(12.0)	
Monthly Family income in Taka	6000-20000	89(88.1)	12(11.9)	$\chi^2= 62.091$ df=3 $p<0.001$
	21000-35000	53(91.4)	5(8.6)	
	36000-50000	17(85.0)	3(15.0)	
	51000-60000	09(75.0)	3(25.0)	
	Total	168(88.0)	23(12.0)	

Discussion

In this study patients' mean age was 48.28±12.565 years while the range was 20-80 years. Most (28.8%) of the patient had onset of type 2 diabetes mellitus between 41 to 50 years which is almost consistent with a study conducted in India⁴ revealed that most of the patients had onset of type 2 diabetes mellitus between 40 to 60 years. A study carried out in USA⁵ revealed that minorities and low-income populations carry a disproportionate burden of the disease. This study result is consistent with the present study in the context of low income group. According to the complication of diabetes mellitus, 10.2% patients with no complication of diabetes mellitus and 15.9% with complication had border line cognitive capacity. A study conducted in India⁴ showed that association of complications like hypertension and nephropathy with cognitive dysfunction was statistically significant ($p<0.05$). The level of cognitive capacity by overall glycemic status of the patients was statistically significant ($p<0.05$). In a study conducted in Turkey⁶ revealed that attention and calculation capacity among non

diabetic group was greater compared to the diabetic group and it was statistically significant ($p < 0.05$). According to complication of diabetes mellitus, 10.2% patients with no complication of diabetes mellitus and 15.9% with complication had border line cognitive capacity. A study conducted in India showed that association of complications like hypertension and nephropathy with cognitive dysfunction was statistically significant ($p < 0.05$).

By age of the patients, 4.5% patients in the age group of 20-30 years, 3.6% in the age group of 41-50 years and 39.4% in the age group of 61-80 years had border line cognitive capacity. In a study conducted in USA⁷, a statistically significant ($p < 0.05$) age-adjusted association was observed between the HbA1C level and the MMSE score of cognitive capacity. The present study revealed that 16.0% male and 7.1% female patients had border line (Range in MMSE score is 18-23) cognitive capacity. On the other hand, 84.0% male and 92.9% female patients had normal (Range in MMSE score is 24-30) cognitive capacity. This difference of level of cognitive capacity by the sex of the patients was statistically significant ($p < 0.05$). A study conducted in Brazil¹ showed that mean total MMSE score was 26 points, with a range from 16 to 30. Male patients presented higher MMSE score than female patients. In the same study¹, the mean age of the male patients was 26.3 ± 3.2 years and in female patients it was 24.8 ± 2.7 years and the result was statistically significant ($p < 0.05$). Male patients usually do not maintain diet, do not perform physical exercise and reluctant in maintaining proper treatment. So, more male patients had border line cognitive capacity than that of the female patients.

Conclusion

In this study majority of patients found uncontrolled glycemic status and had normal cognitive capacity. About 12% of patients

had border line cognitive capacity and it was significantly associated with age. With the ongoing increase in the size of the elderly population, type 2 diabetes mellitus associated cognitive impairment becoming increasingly larger problems. It is also important to initiate the management of type 2 diabetes mellitus patients at an earliest possible time for prevention of cognitive impairment and other complications.

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