ASSESSMENT OF COGNITIVE IMPAIRMENT AMONG TYPE 2 DIABETES MELLITUS PATIENTS IN A SECONDARY CARE TEACHING HOSPITAL

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ABSTRACT

Background: Diabetes mellitus (DM) is extensively accepted worldwide as an epidemic associated with micro and macro-vascular complication. Various studies have proposed a relation between diabetes declining cognitive function. Cognitive dysfunction as important complication of diabetes needs to be recognized by healthcare providers and screening for the same be recommended. **Objective:** The study examined the cognitive status of diabetes and non-diabetes with the Montreal Cognitive Assessment test (MoCA). **Method:** A matched case-control study was undertaken in the in-patient department of general medicine in a teaching hospital for a period of 6 months. The study group included forty-five participants with and without diabetes and cognitive assessment was done using MoCA test. **Result:** 53% of the control group had normal cognition whereas only 9% among the case scored above 26 and found to have normal cognition. Among the forty-five study subjects included as the cases, 56% scored less than 18 and was thus identified to have dementia and Mild cognitive impairment (MCI) was found in 36%. **Conclusion:** Diabetes patient were found to have cognitive decline when compared to non- diabetes. It is important to include cognitive status assessment among diabetes patients as part of their routine follow up for early identification of cognitive impairment.

KEYWORDS: Diabetes mellitus (DM), mild cognitive impairment (MCI), Montreal cognitive assessment scale (MoCA).

INTRODUCTION

Diabetes mellitus (DM) is caused due to the presence of elevated blood sugar level.[1]

It is of two types: Type 1 DM and Type 2 DM

Type 1 DM: It is also called as growth onset diabetes mellitus/ juvenile diabetes mellitus. It is caused due to self-degradation of β cells present in pancreas, it occurs mainly in adolescent and young children. Due to the rapid degradation of β cells, it often leads to the occurrence of diabetic ketoacidosis.[2]

Type 2 DM: It is also called as (NIDDM) Non-insulin dependent diabetes mellitus, caused due to lack of insulin production. Most people show an increased plasminogen activator inhibitor type1 level, low HDL cholesterol level, bp changes and an increased triglyceride level. Due to these clustering complications, it is referred as the insulin resistant syndrome.[2]

Cognitive impairment (CI)

It is called as a person's inability in learning new things, remembering and taking accurate decision that influences their daily activities. Symptoms include lethargy, confusions, deprived short term or long term memory. Cognitive decline is a micro vascular complication. In developing countries, CI and dementia are increasing over the time.[3]

Risk factors of cognitive impairment includes

Demographic risk factor: Ageing and lack of education.

Genetic factor: Dementia is caused due to autosomal genes.

Medical risk factor: The cause of degenerative dementia is Alzheimer's disease and cardio vascular disease.

Other factors like smoking, DM and alcohol consumption also contributes to dementia.[4]

Diagnosis of cognitive impairment[5]

- Computed tomography [CT]
- Positron emission tomography[PET]
- Magnetic resonance imaging[MRI]

- Near infrared spectroscopy[NIRS]

- Magneto encephalography[MEG]

Screening methods to assess the cognitive impairment[6]

1. **Mini mental examination scale [MMSE]:** It is mainly used method to measure cognition. It takes about 7-10 min. it includes counting backward, identifying objects and telling current date.

2. **Clock drawing:** It is used to measure cognition using numerous scoring algorithms.

3. **Mini cog test:** It is a 3min test that is used for the primary screening of dementia. It includes drawing a clock and recollecting three words list of things.

4. **Addenbrooke's scale:** It is used to identify cognition in conditions like dementia.

5. **Modified mini mental scale [3MS]:** The new edition of MMSE. It includes four modified items (delayed recall, abstract, category fluency, long term memory) and administrated uniquely.

6. **Memory Impairment Screen:** It is a four-item scale which takes 5 min to administer which shows good understanding and specificity in classifying dementia.

7. **Montreal cognitive assessment scale:** It is used to screen cognitive impairment [CI]. It includes naming given pictures, drawing clock, copying the shape of the given object.

METHODOLOGY

Study site

The proposed study was conducted in the inpatient department of General Medicine, K. C General Hospital, Malleshwaram, Bangalore, Karnataka.

Study design

Case-control study

Study duration: September 2019 to February 2020

Study criteria

Inclusion criteria

- **Case:-** Female and Male patients of age 45 years and above diagnosed with type 2 diabetes.

- **Control:-** Non diabetic male and female patients of age 45 years and above.

- Patients who were willing to participate in the study.

Exclusion criteria

- Patients taking cognition impairing drugs
- Past history of stroke, infectious brain diseases, neoplasm, psychiatric illness, drug abuse, visual problems, mobility and motor coordination dysfunction, head trauma.
- Patients not willing to join the study

Study procedure

The MoCA scale developed by Dr. Ziad Nassreddine was used for the screening of MCI. it consists of 8 domains viz visual examination, naming, attention, language, abstraction, memory, orientation and delayed recall. An average of 15 min is required to do the questions by the patient and can be returned on the same day for estimation. This tool is available in English and is given to patients who do not know local language. This screening can be self-administered or interview based on the educational status of the patient.[4]

The assessment done as follows

Visual examination: The subject asked to number the correct order of the alphabets, draw a clock with the mentioned time and draw a cube.

Naming domain: The subject asked to identify and name the 3-animal given.

Memory: The participants asked to keep 5 words in mind as mentioned by the interviewer and then do 2 trails, after that recall the words after 5 minutes.

Attention: The number will be given to the participants and it should be repeated in the ascending and descending order

Language: The subject will be asked to repeat the two sentences said by the interviewer.

Abstraction: Explain the similarity between the objects, examples will be quoted.

Data collection form is used to record the patients drug therapy, social habits, duration of diabetes, family history of the patient and life style.

Scoring of each domains

The scoring are as follows: Visuospatial-3, Naming -3, Attention-3, Language-3, Abstraction-2, Delayed recall-5, orientation-6. In case the person had <12 years of education, additional one mark will be given according to MoCA scale rule.

Scores mainly depends on the educational status of the patients. The total score is 30, out of which each domains have respective score. If the patient scored {<18}, it will be categorized as the dementia, {18-25} of MCI and {>26} of normal cognition.[7]

RESULTS

90 patients were assessed for cognitive dysfunction during the study period. The demographic details including age, gender, psychosocial habits and educational status are shown in table1.

Table 1: Socio- Demographic characteristics of patients.

Sl. no.	Variable	Category	Case n (%)	Control n (%)
1.	Age group	45-55years	24 (53%)	24 (53%)
		56-65years	21(47%)	21(47%)
2.	Gender	Male	24 (53%)	24(53%)
		Female	21(47%)	21(47%)
3.	chosocial habits	Smoking	10(22%)	8(18%)
		Alcohol	8(18%)	4(9%)
		Nil	12(27%)	6(13%)
		Both	15(33%)	27(60%)
4.	ucational status	Illiterate	4(9%)	4(9%)
		1-4std	11(24%)	7(17%)
		5-7std	17(38%)	15(33%)
		8-10std	9(20%)	15(33%)
		11-12/diploma	0(0%)	1(2%)
		PU/PG	4(9%)	3(7%)
		Profession	0(0%)	0(0%)

Table 2: Duration of diabetes (N=45).

Duration of diabetes	Control n (%)
10-15 Years	21 (47%)
16-20 Years	19 (42%)
Above 20 Years	5 (11%)

Out of the 45 patients with diabetes included in the study as cases, 42 and 47% of patients had duration of DM between 10-15 years, 16-20 years respectively. 11% had diabetes for more than 20 years. The details are shown in table 2 and fig 3. 67% of the patients were on OHAs followed 18% on both insulin and OHAs. The details of which are depicted in "Fig 1".
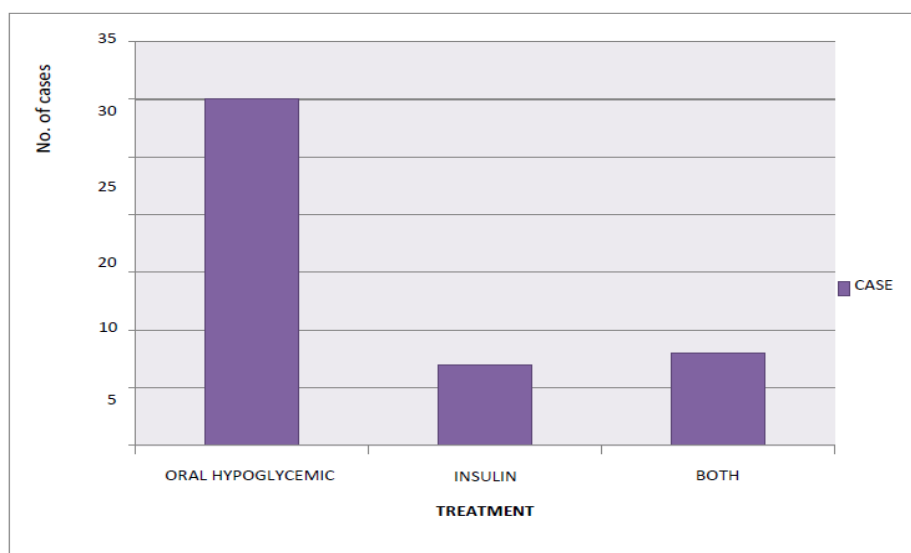
Fig. 1: Prescribing pattern of antidiabetics.

Table 3: Comorbid diseases.

Comorbid diseases	Case n (%)	Control n (%)
Htn	15(33%)	9(20%)
Asthma	3(7%)	6(13.3%)
Ihd	2(4%)	0(0%)
Uti	0(0%)	1(2%)
Ald	0(0%)	3(7%)
Copd	1(2%)	0(0%)
Tb	3(7%)	1(2%)
Hypothyrodism	0(0%)	1(2%)
Gerd	2(4%)	0(0%)
Hiv	0(0%)	1(2%)

Major diagnosis included HTN, 33% and 20% in case and control respectively followed by Asthma. The details of which are depicted in table 3.

Table no. 4: Assessment of cognitive impairment.

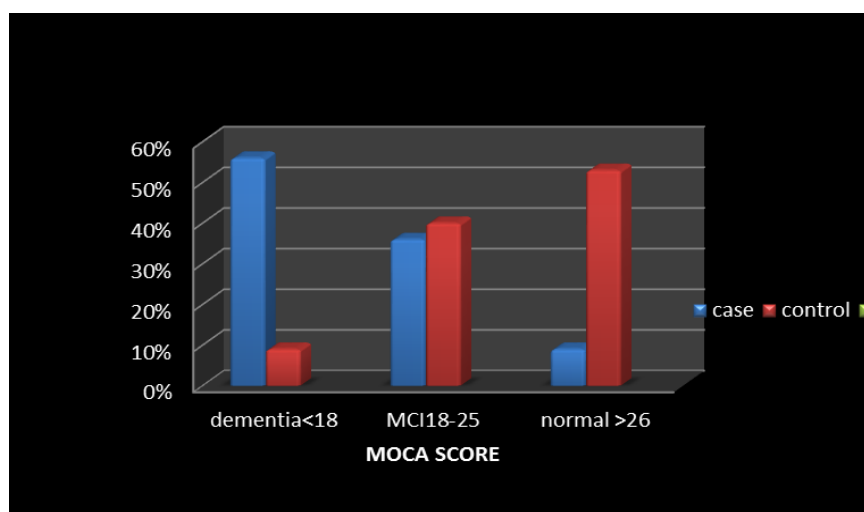| Moca score	Case n (%)	Control (%)
Dementia (<18)	25(56%)	4(9%)
Mci (18-25)	16(36%)	18(40%)
Normal (>26)	4(9%)	23(53%)

Fig. 2: Assessment of cognitive impairment.

The MoCA was used to estimate cognition among the study groups. Among the 45 study subjects included as the cases, 56% scored less than 18 and was thus identified to have dementia and MCI was seen in 36%. 53% of the control group had normal cognition whereas only 9% among the case scored above 26 and found to have normal cognition. The details of the same can be seen in table 5.

Table 5: Comparison of cognitive domain score.

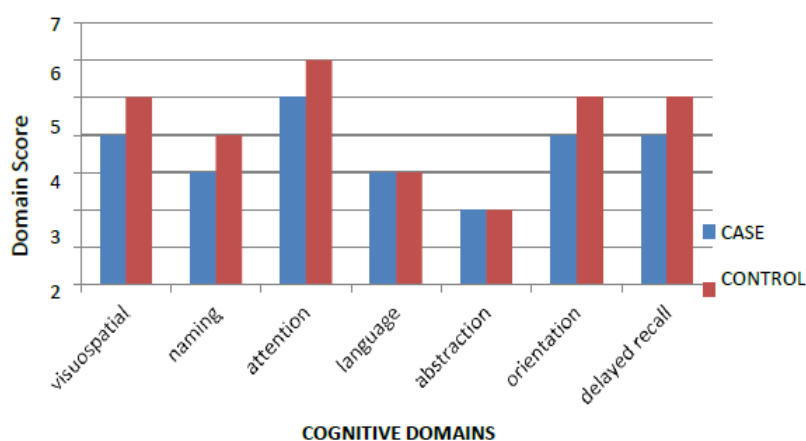| Domains	Casescore	Control score
Viso examination	4	5
Naming	3	4
Attention	5	6
Language	3	3
Abstraction	2	2
Orientation	4	5
Delayed recall	4	5

Fig. 3: Comparison cognitive domain score.

There was no significant difference identified with regard to MOCA cognitive domain scores between the case and control depicted in table 5 and "Fig 3". But slightly higher score in Control and delayed recall in the control group were observed.

DISCUSSION

The cognitive function of diabetic and nondiabetic patients was examined using MoCA scale during the study period. Majority of the patients among the case showed dementia 56% and MCI 36% and normal cognition 9% and among the control 9% showed dementia 40% MCI and 53% normal cognition. In a similar study conducted by C.V. Lalithambika *et al,* DM group showed 54% MCI and 45% normal cognition. Many studies have already reported that blood glucose irregularity as well as atherosclerotic risk factors viz dyslipidemia, elevated blood pressure, renal dysfunction and metabolic syndrome are associated with CI deterioration among DM subjects.[7]

In the present study there was no significant difference identified with regard to MOCA cognitive domain scores between the case and control but a slight improvement in visuospatial, naming, orientation and delayed recall in the control group were identified whereas in a similar study conducted by Tuba et al no major difference were observed between non diabetic and diabetic groups. [9]

In our present study HTN and asthma are the more prevalent comorbid condition among the study group. According to a study conducted by Hassing.L. B et al, HTN alone is not related with cognitive dysfunction. Comorbid DM and hypertension increase the threat for dysfunction. Various mechanism by which these conditions causing cognitive impairment have been suggested. High blood sugar in rats, affected the synthesis and release of acetyl choline in brain and loss of cortical neurons. High blood pressure is considered to be a risk factor for cerebrovascular disorders, white matter lesion and lacunar brain defect [10,11,12]

CONCLUSION

Based on the results of our study, diabetic patients found to have cognitive decline when compared to non-diabetic. It is important to include cognitive status assessment among diabetic patients as part of their routine follow up for early identification of cognitive impairment. MoCA is an effective tool for screening CI and it can be used to assess cognitive status of diabetic patients in their routine follow up.

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