Original article:

Effect of complications of diabetes mellitus on the mental health of a patient

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Abstract:

Diabetes mellitus is highly prevalent in the entire world, the prevalence being the highest in India. It has devastating effects on almost all organs of the body. It also has significant effect on the mental health of the patient. Also, diabetics with complications tend to have higher decline in cognitive function as compared to those without complications. We assessed 60 subjects, which included 34 males and 26 females. 30 subjects had diabetes without complications and 30 with complications. A detailed relevant history of the subjects was obtained. Detailed general and systemic examination was done. HbA1c% of each subject was recorded. Each diabetic was checked for the presence of any complications. Suitable investigations were carried out to check for the complications. The cognitive status of each subject was assessed using MMSE. The average MMSE scores of Diabetics without complications was found out to be 26.9 and those of diabetics with complications was found out to be 23.8. Also the Chi square test showed no significant association between MMSE scores and HbA1C values. ($p<0.05$).

Keywords: Diabetes mellitus , mental health

Introduction:

Diabetes is a chronic disease affecting almost every organ in the human body. According to the World Health Organization, about 300 million people would suffer from diabetes by 2025 [1]. India is the largest hub of diabetic population in the world and by 2025, the diabetic population of India is estimated to be approximately 69.9million [1]. The devastating effects of diabetes mellitus on retinal, renal, cardiovascular, and nervous system are widely known. Although diabetes has been highly considered as a risk factor for cognitive impairment, but still the cognitive function of diabetic patients is not usually evaluated in routine clinical examination. The role of duration of diabetes, the diabetic control and microvascular complications leading to cognitive decline has not been well studied.[2] Patients with diabetes can develop various complications like retinopathy, neuropathy, nephropathy, gastro paresis, high blood pressure and so on. Diabetes, if detected early and controlled by various drugs and cognitive training, can prevent dementia in later life. Various tests are used to assess the mental status of a diabetic patient. These tests include Digit Symbol Substitution Test (DSST), Mini Mental Status Examination (MMSE), Rey Auditory Verbal Learning Test and Stroop Test.

The MMSE is a screening tool for detecting changes in the cognitive skills [3]. It was devised by Folstein et al, in 1975.[2]. It is very useful for identifying changes in cognitive function for the elderly without dementia The patients with impaired glucose tolerance, after undergoing various investigations, have shown to have a lower mini-mental status exam score.The study will help to estimate the relationship between complications of diabetes mellitus and cognitive factors of a subject. It will also compare the mental health of patients suffering

from diabetes without complications to those with complications. Thus, this study will differentiate the high risk diabetic patients from the low risk ones, thus enabling us to provide them with better support and care.

Materials and methodology:

After the approval of the ethical committee, a case control study testing the cognitive status of 30 diabetics without complications and 30 diabetics with complications was carried out. An informed consent was taken from each and every diabetic. 30 diabetics without complications were considered as controls and 30 diabetics with complications were taken as cases. Both males and females suffering from either type 1 or type 2 were considered in the study.

Drowsy and comatose patients, those with hepatic encephalopathy, and previously diagnosed as mentally retarded were excluded from the study. A detailed relevant history of the subjects was obtained. Detailed general and systemic examination were done. HbA1c% of each subject was recorded. Each diabetic was checked for the presence of any complications. The investigations for each complication were carried out. Fundus examination for retinopathy, checking the vibration sense by using 128 Hz tuning fork for neuropathy, dipstick test for nephropathy and ECG was done.

The patients were divided into two groups: Control(diabetic without complications) and Cases(Diabetics with complications). The MMSE was done for both the controls and the cases. After the subjects were done filling up the MMSE questionnaire, the MMSE score was calculated for each subject belonging to group A and group B.

MINI MENTAL STATE EXAMINATION:

Patient's Name: _____ Date:_____

MAXIMUM SCORE	PATIENT'S SCORE	QUESTIONS
5		What is the year? Season? Date? Day? Month?
5		Where are we now? State? County? Town? Hospital? Floor?
3		The examiner names three unrelated objects clearly and slowly, then the instructor asks the patient to name all three of them. The patient's response is used for scoring.
5		I would like you to count backward from 100 by sevens.(93,86,79,72,65_____) Alternative: Spell WORLD backwards.
3		Earlier I told you the names of three things. Can you tell me what those

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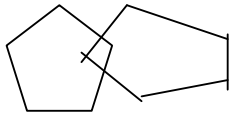
		were?
2		Show the patient two simple objects such as a wristwatch and a pencil, and ask the patient to name them.
1		Repeat the phrase: No ifs, ands, or buts.
3		Take the paper in your right hand, fold it in half, and put it on the floor.
1		Please read this and do what it says.(Written instruction is" Close your eyes")
1		Make up and write a sentence about anything.(This sentence must contain a noun and a verb)
1		Please copy this picture. 
30		TOTAL

TABLE 1: Evaluation of MMSE Scores.

MMSE SCORE EVALUATION:

MMSE Score	0-10	10-20	20-25	25-30	TOTAL
Diabetes mellitus without complications.	0	6	5	19	30
Diabetes mellitus with complications.	0	8	18	4	30
TOTAL	0	14	23	23	60

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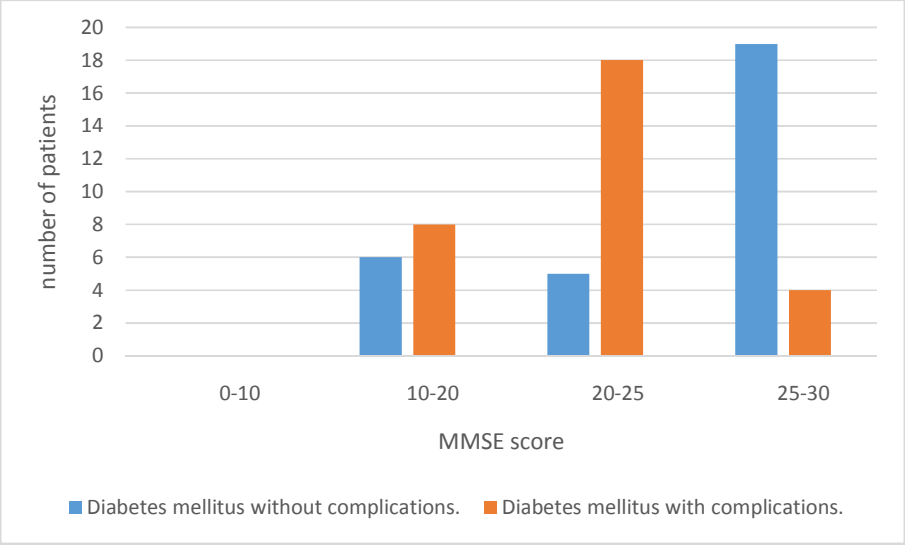
INTERPRETATION OF THE MMSE SCORES:

Score	**Degree of Impairment**	**Formal Psychometric Assessment**	**Day to Day Functioning**
25-30	Questionable significant	If clinical signs of cognitive impairment are present, formal assessment of cognition may be valuable.	May have clinically significant but mild deficits. Likely to affect only most demanding activities of daily living.
20-25	Mild	Formal assessment may be helpful to better determine pattern and extent of deficits.	Significant effect. May require some supervision, support and assistance.
10-20	Moderate	Formal assessment may be helpful if there are specific clinical indications.	Clear impairment. May require 24 hour supervision.
0-10	Severe	Patient not likely to be testable.	Marked impairment. Likely to require 24 hour supervision and assistance with ADL.

Results:

FIGURE 1: Evaluation of MMSE Scores.



Average score of group A- 26.9

Average score of group B-23.8

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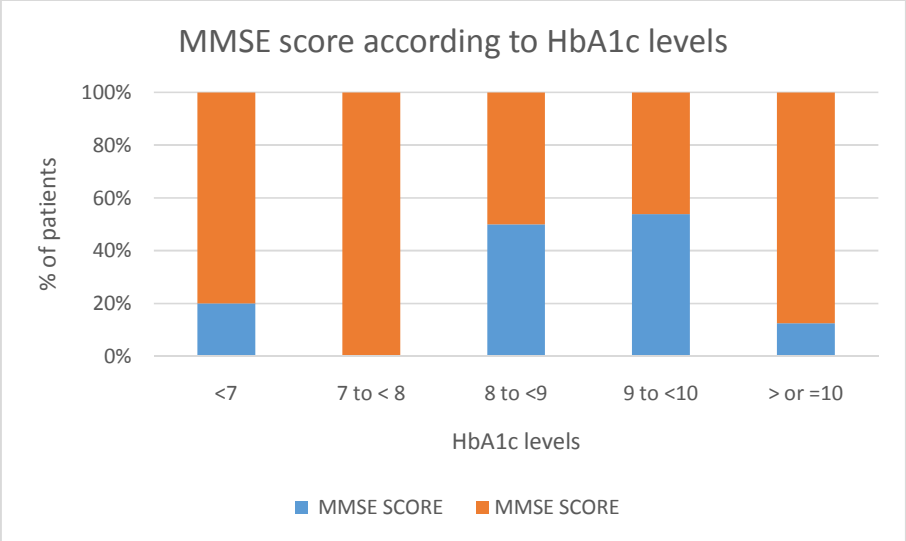
TABLE 2:Comparison Between HbA1c levels and MMSE Scores.

	MMSE SCORE <20	**MMSE SCORE 20-30**	**TOTAL**
HbA1C			
<7	**1**	**4**	**5**
7 to < 8	**0**	**6**	**6**
8 to <9	**6**	**6**	**12**
9 to <10	**7**	**6**	**13**
> or =10	**3**	**21**	**24**
TOTAL	**17**	**43**	

FIGURE 2:Comparison between HbA1C levels and MMSE scores:



For the application of Chi square test, HbA1C groups are pooled.

One group is HbA1C below 9 and the other is above 9. The Chi square test showed that there is no significant association between MMSE scores and HbA1C values. [p> 0.05].

Discussion:

In our study, 34 males and 26 females were considered. 16 males had diabetes without complications while 18 had diabetes with complications. In the same way, 14 females had diabetes without complications while 12 had diabetes with complications. When calculating the percentages, we found 53.33% males without complications and 60% with complications. On the other hand, 46.66% females were found without complications while only 40% had complications. Thus , we can conclude that males were more at risk of diabetes with complications than females. [4]

In our study, we found 20% subjects with diabetic retinopathy, 53.33% with neuropathy and 33.33% with nephropathy. This indicates that according to the above study, the prevalence of Diabetic Neuropathy is more compared to other complications included in the study. Normal HbA1c level is below 6%, and in diabetics it is

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6.5% or more. Higher the HbA1c level, more is the risk of microvascular complications like Retinopathy, Neuropathy and Diabetic Nephropathy. [5]

In our study, more diabetics without complications had a MMSE score between 25-30, while very few had a score less than 25. On the other hand, more diabetics with complications had a score between 20-25, a few had between 10-20 and very few had between 25-30. Also, the average score of diabetics without complications is 26.9 and of those with complications is 23.8. This indicates that more diabetics without complications had questionably significant cognitive impairment, while only a few had mild to moderate impairment. On the other had more diabetics with complications has mild to moderate cognitive impairment. Thus, indicating that the effect of cognitive impairment increases with complications. [1]

Conclusion:

For the application of chi square test, HbA1c groups were pooled. One group of HbA1c was taken below 9 and the other above 9. Chi square test showed that there is no significant association between MMSE scores and HbA1c values[$p>0.05$]. However, this study has a number of limitations. The sample size taken was very small. Other causes of dementia were not ruled out. Also, MMSE is strongly influenced by the levels of literacy, language, cultural and ethical norms.

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