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Assessment of Cognitive Function in 36 Type 2 Diabetic Women in Erbil City

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Abstract

Background: *Recent evidence from several epidemiological studies suggests that diabetes is a risk factor for cognitive dysfunction, Diabetes is associated with a 1.5 to 2 fold increased risk of dementia, This has been explained by secondary diabetic encephalopathy which occurs as a result of micro- and macro-vascular disorders or due to repeated episodes of hypoglycemia induced by excess insulin, It is important to assess the effect of diabetes on cognitive function, a part from chronic complications and co-morbidities.*

Subjects and methods: *This cross sectional controlled study was carried out at Rezgary and Erbil teaching hospitals in Erbil city. A total of 36 Apparently healthy women were recruited and used as a control group for comparison, A total of 36 type 2 diabetic women without co-morbidities and with no apparent chronic complications of diabetes were recruited, The subjects were fasting, their cognitive function was assessed using mini-mental state examination score, fasting plasma glucose measurement and estimation of glycosylated hemoglobin (HbA1c) done for diabetic patients and fasting plasma glucose estimated for control group.*

Results: *The mean fasting plasma glucose of diabetics was 213.78 mg/100ml and that of control subjects was 95.67 mg/100ml. The mean mini-mental state examination score for diabetics was 17.53 and for control group was 17.56. There was no correlation between mean HbA1c and mean mini-mental state examination score of diabetics, Also no correlation found between duration of the disease and cognitive function.*

Conclusions: *1-Uncomplicated diabetes without co-morbidities does not cause declining cognitive function 2-There is no correlation between cognitive function and glycemic control in type 2 diabetic patients*

Keywords: *dementia-glycemia, glucose-mental state.*

Introduction

Diabetes mellitus is a common disease worldwide, In adults more than 20 years old more than 8.6% of the USA population is diabetic, and it is expected to increase especially type 2 diabetes[(1).] It is well established that diabetes is an independent risk factor for eye, kidney and neurological diseases as well as for cardiovascular morbidity and mortality, recent evidence from several epidemiological studies suggests that it is also a risk factor for cognitive dysfunction [(2).] Cognitive function refers to mental abilities used to engage in different aspects of everyday life [(3)]. The concept Mild Cognitive Impairment (MCI) has been introduced to describe cognitive impairment in non demented subjects, It is mentioned that

unregulated diabetes Mellitus is among the causes of mild cognitive impairment [4]. Dementia is a clinical syndrome characterized by "a global deterioration of mental functioning in its cognitive, emotional and conative aspects[5]. Diabetes is associated with a 1.5 to 2 fold increased risk of dementia[6]. This has been explained by secondary diabetic encephalopathy which occurs as a result of micro- and macro-vascular disorders or due to repeated episodes of hypoglycaemia induced by excess insulin[7]. Evidence from neuro-cognitive testing suggests that cognitive dysfunction should be listed as one of the many complications of diabetes, along with retinopathy, neuropathy, nephropathy, and cardiovascular disease[8]. However, other diabetes-related factors, such as macrovascular disease, hypertension and depression, may contribute more to previously observed cognitive decrements in Type 2 diabetes[9]. It is important to assess the effect of diabetes on cognitive function, a part from chronic complications and co-morbidities.

Methods

This controlled cross sectional study was carried out during a period from 2nd January 2011 to the third February 2011 at Rezgary and Erbil teaching hospitals. A total of 36 Apparently healthy women were recruited and used as a control group for comparison, An informed consent was sought and obtained from each subject before starting interview and taking blood samples. The subjects were fasting, their cognitive function was assessed using mini-mental state examination (Which is attached as an appendix) since it is a reliable instrument that allows practitioners to accurately measure cognitive deficits and deterioration over time and It can be used in a variety of clinical settings.[10], then 2 ml sample of blood withdrawn from an anti-cubital vein for fasting plasma glucose measurement, subjects with hearing difficulty, visual problems, and speech problems were excluded from the study in addition to any one proved to be diabetic or hypertensive. A total of 36 type 2 diabetic women without comorbid-ities and with no apparent chronic complications of diabetes were recruited, A thorough medical history and physical examination were performed. Diagnosis of diabetes done if fasting plasma glucose was 126 mg/100ml or more[11]. Each diabetic patient assessed for cognitive function using mini-mental state examination, then 2 ml sample of blood withdrawn from an anti-cubital vein for fasting plasma glucose measurement and estimation of glycosylated hemoglobin (HbA1c) to assess their glycemic control as HbA1c is a standard clinical assessment of glycemia and the basis of most data relating glycemic control to complications [12].

Patients with hearing difficulty, visual problems, and speech problems were excluded from the study. Data were stored and analyzed using SPSS (statistical package for social sciences), (Windows Version 12) software. Differences between group's means were determined by independent sample t test (2-tailed), The significance level was set at $P<0.05$. [13]

Results of the Study

Part 1 of Results

Comparison between certain parameters of both control group and study group.

Table: 1 Mean age and number of control and study groups

Category	Control group	Study group	P value 2-tailed t-test
Mean age	51.17	50.50	0.742
Gender	Female	Female	
Total number	36	36	Not significant

Table 2 Mean fasting plasma glucose of control and study groups

Category	Control	Patients	P value 2-tailed t-test
Mean FBS	95.67	213.78	0.00
Number	36	36	Significant

Table 3 Mean mini-mental state examination score (MMS-E score) of control and study groups

Category	Control	Patients	P value 2-tailed t-test
Mean MMS-E score	17.56	17.53	0.966
Number	36	36	Not significant

Part 2 of Results

Correlations between MMS-E score and certain parameters among study group;

Table4 Correlation between Mean percentage of HbA1c and mean MMS-E score.

Category	Mean MMS-E score	Mean percentage of HbA1c	P Value 2-tailed t-test
36 diabetic patients	17.53	7.57%	0.687
Number	36	36	Not significant

Table 5 Correlation between mean MMS-E score and duration of diabetes.

Category	Mean MMS-E score	Mean duration of diabetes/years	P Value 2-tailed t-test
36 diabetic patients	17.53	5.38	0.762
Number	36	36	Not significant

Table 6 Correlation between mean age of study group and mean MMS-E score

Category	Mean MMS-E score	Mean age of study group/years	P Value 2-tailed t-test
36 diabetic patients	17.53	50.5	0.002
Number	36	36	Significant

Discussion

Previous studies found conflicting results regarding effect of diabetes on cognitive function, Cukierman *et al* stated that compared to people without diabetes, people with diabetes have a greater rate of decline in cognitive function[(2).] Cosway *et al* also concluded that some aspects of Type 2 diabetes does relate significantly to cognitive function [(9).] . Latha *et al* stated that diabetes mellitus increases not only the risks of dementia and mild cognitive impairment but also the risk of progression from such impairment to dementia[(14).] Tekin *et al* Suggested that cognitive function assessment should be routine procedure in the management of type-2 diabetes mellitus[(15).] But it is not clear whether cognitive impairment is caused by hyperglycemia due to diabetes itself, or it is caused by associated co-morbidities or complications like hypertension, micro-and-macrovascular disease which are commonly found among diabetic patients, the existence of a primary diabetic encephalopathy is unclear, repeated or prolonged hypoglycemic attacks may produce dementia and irreversible pathological changes[(16).] In current study type 2 diabetic patients without complications have been studied,

no significant differences found between min-mental state examination scores of diabetic and control group, Similar findings also recorded by Rostam who stated that the result of min-mental state examination scores was not difference in diabetic and non-diabetic subjects, he used additional tests and concluded the presence of relationship between cognitive dysfunction and diabetes mellitus [(17),] In this study only women included for both groups which were at the same age average, to establish matching between both groups for better cognitive function comparison, While the previously mentioned studies included both men and women, with and without complications and co-morbidities, that may explain the differences between different studies. according to this study type 2 diabetic patients without complications have no significant cognitive function impairment, this is further supported by absence of correlation between cognitive function and HbA1c in this study, Absence of such correlation also found by Renata *et al* who stated that glycemic control measured by A1C had no association with min-mental state examination score and possible dementia in the evaluation period[(18)] · The same conclusion has been confirmed by Cosway *et al* which stated that No associations were found between current glycaemic control (HbA1c) and any cognitive function or information processing variable[(9)]

Conclusions

1. Uncomplicated diabetes without co-morbidities does not cause declining cognitive function
2. There is no correlation between cognitive function and glycemic control in type 2 diabetic patients

Recommendation

We suggest further studies regarding cognitive function on larger sample of diabetic patients without chronic complications and with specific chronic complications.

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Appendix

Mini-Mental State Examination (MMSE)

Patient's Name: Date:

Instructions: Score one point for each correct response within each question or activity.

Maximum Score. Patient's Score

Questions

5 "What is the year? Season? Date? Day? Month?"

5 "Where are we now? State? County? Town/city? 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. The examiner repeats them until patient

learns all of them, if possible.

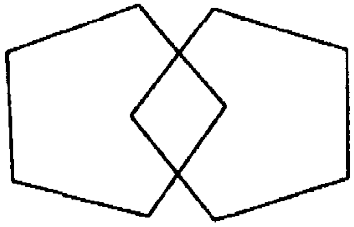
5 "I would like you to count backward from 100 by sevens." (93, 86, 79, 72, 65, …)Alternative: "Spell WORLD backwards." (D-L-R-O-W)

3 "Earlier I told you the names of three things. Can you tell me what those 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."
(The examiner gives the patient a piece of blank paper.)
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." (The examiner gives the patient a blank piece of paper and asks him/her to draw the symbol below. All 10 angles must be present and two must intersect.)
30 TOTAL



Source: Folstein MF, Folstein SE, McHugh PR:. Mini-mental state: A practical method for grading the cognitive state of patients for the clinician." J Psychiatr Res 1975;12:189-198.