

Interplay between Diabetes Mellitus and Psychiatric Disturbances in Memory in Type I Diabetics

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Abstract:

Multiple aspects of cognitive function and psychological disturbances may be disrupted in adolescents with type-1 impact of type 1 diabetes mellitus, glycemic control and other relevant parameters on memory and some psychiatric aspects. The study was conducted on 78 subjects, 39 patients with type-1. diabetes mellitus and 39 apparently healthy subjects as controls. After full history taking and physical examination, each individual enrolled diabetes mellitus. To determine the into the study was sampled for fasting and postprandial blood glucose, kidney and liver function tests and complete urine analysis. All subjects were tested for memory efficacy and some psychiatric aspects. Subjects were given multiple tests which are, memory processes scale, Benton visual retention test, Digit span and Middle Sex Hospital Questionnaire (M.H.Q.). For each diabetic patient, 2 random blood glucose determination before and after the neuropsychiatric assessment, glycosylated haemoglobin, fundoscopy, nerve conduction velocity and Doppler study were done. The study showed that there were significant differences between cases and controls in retention and remember, Benton visual test and forward recall in Digit span. While among diabetic subgroups, the following results were obtained: Memory processes scale ; there were significant differences in retention and memory changes with aging in patients with history of hypoglycemia ; in retention for uncontrolled diabetics ; in remember and retention among females and in memory change with aging for those who had diabetes for more than 5 years.

* Benton visual retention test ; there were significant difference only in obtained correct score among uncontrolled diabetics.

* Digit span ; there were significant differences in forward recall of digits in patients with history of hypoglycemia and backward recall of digits among females than males.

* M.H.Q. ; patients who had history of hypoglycemia and those with short duration of diabetes showed high score on depression while patients with uncontrolled diabetes and female patients had higher score on anxiety and depression.

Conclusion : Our results indicate that memory is mildly and selectively disturbed in adolescents with type 1 diabetes mellitus. An increased prevalence of depression in diabetes relative to other psychiatric illnesses.

Introduction

Diabetes mellitus is a highly complex metabolic disorder that affects virtually every system of the body (McCall 1992). Glucose is the primary substrate for the brain, because neurons are unable to synthesize or store glucose, it is likely that disorders in glucose metabolism affect

cognitive function (Craft et al., 1996). Cognitive dysfunction is associated both with disease pathogenesis (hyperglycemia or insulin insufficiency) and diabetes treatment (hypoglycemia and hyperinsulinism) (Rovet and Danem 1997). The young brain is especially

vulnerable to diabetes and its treatment (Puczynski, 1997). Because children and adolescents with type-1 diabetes mellitus are at risk for frequent high and low blood glucose excursions, it is not surprising that multiple aspects of cognitive function may be disrupted (McCall and Figlewicz, 1997). Many researches have suggested that diabetic patients have higher levels of psychological disturbances especially depression (Gavard et al., 1993 ; Kavocs et al., 1995 and Alan et al., 1997). Because altered cognitive function has important implications for educational performance and vocational effectiveness, this study is aimed to evaluate the possible impact of diabetes mellitus, glycemic control, gender and other relevant parameters on cognitive function and some psychiatric aspects .

Subjects and Methods

The present study comprised 78 subjects. They were divided into two main groups as follows :-

Diabetic group : Included 39 patients with type-1 diabetes mellitus, 21 males and 18 females with an age range from 19 - 25 years (21.15 ± 1.42 years). Illness duration was > 2 years, the diabetic state was diagnosed at a mean age of 15.46 ± 2.71 years and the duration of diabetes ranged from 2 - 9 years (5.7 ± 2.73 years). Diabetics were diagnosed according to the standards of National Diabetes Data group 1979. All of them were diagnosed type 1 diabetes mellitus as they were of young age, normal body built, low plasma insulin (was available in only 15 diabetics) and they received insulin treatment from the early beginning of their illness (Foster 1994). All of them were treated conventionally with two injections per day of human insulin. They showed no evidence of microvascular and / or macrovascular complications as

assessed by thorough history and full clinical examination as well as absence of microalbuminuria, normal nerve conduction velocity, fundus examination, electrocardiogram and doppler study of peripheral vessels. Fifteen of them have had a history of more than one attack of acute diabetic complications as hypoglycemia and / or diabetic ketoacidosis. Diabetic subjects were selected from the out patient clinic of Zagazig University Students' Hospital. All of them were undergraduates in different faculties **Controls :** This group comprised 39 apparently healthy friends of the diabetic subjects . Each diabetic was asked to recruit of his friends, a properly matched control subject considering age, gender, socioeconomic status as well as scientific institution. In case of mismatch regarding any of the aforementioned parameters and / or presence of an apparent health problem, another control subject was evaluated. They were 21 males and 18 females with an age range of 20 - 25 years (21.3 ± 1.3 years).

Methodology

All patients and controls were submitted to the following :-

- * Thorough history and full clinical examination.
- * General screening investigations including: -
 - Laboratory tests: Fasting and post-prandial blood glucose, liver function tests, Kidney function tests, using dimension Es and auto analyser system (Dupont Wilmington DE 19898 USA), and complete urine analysis.
 - Plain chest X ray, electrocardiography and fundoscopy.
 - Neuro psychiatric assessment (discussed later).

For diabetic patients, the following has been done also :

- Two random blood glucose determination before and after the neuropsychiatric assessment .
- Estimation of glycosylated haemoglobin (GHb-HbA1) by microchromatographic technique using Helena Glyco Hb Quik Column Procedure (Trivelli 1971).
- Quantitative determination of microalbumin in urine according to the method of **Minetti et al., (1997)** .
- Nerve conduction velocities evaluation (**Duck et al., 1987**).
- Duplex ultrasonographic study of peripheral vessels (**Sharrett 1993**).

Psychometric assessment :

All subjects (diabetics and controls) were subjected to :

- (1) Psychiatric history taking .
- (2) Middle sex Hospital Questionnaire (M.H.G.) (**Gawad et al., 1972**).
- (3) Memory processes scale :

This scale was translated from Perlumeter 1987 by Saif El Dien. It consists of 54 questions for the following items :

- (a) Remember and forgetfulness.
- (b) Changes that occur in memory with aging .
- (c) Retention of information .
- (d) Recall

It is a subjective test .

- (4) Benton visual retention test to measure visual short term memory .
- (5) Digit span .

It is a sub test of Wechsler Adult Intelligence Scale (WAIS), immediate retention is measured. Subjects were asked to learn a series of two to nine digits, which are immediately recalled both forwards and backwards.

Statistical evaluation of the results using student t test .

Results

Table (1): presents differences between diabetics and controls.

Memory processes scale : (At this scale low scores mean better memory)

Diabetics showed impairment in retention and remember of information with mean + SD (33.38 + 9.22 and 36.85 + 8.04 respectively). While controls had better scores on retention and remember of information, with mean + SD (25.85 + 6.95 and 28.77 + 8.02 respectively) with significant differences between both groups ($P < 0.001$, < 0.001 respectively).

Benton Visual Retention Test :

Diabetics had higher obtained error score (8.38 + 2.85) than controls (5 + 2.03) ($P < 0.001$), while diabetics had lower obtained correct score (3.92 + 1.8) than controls (7.15 + 2.72) with significant differences between both groups ($P < 0.001$).

Digit Span :

There was significant difference in forward recalling between diabetics (5.2 + 1.02) and controls (6.62 + 1.09) ($P < 0.001$).

M.H.Q. :

Diabetics showed higher scores on anxiety, hypochondrosis and depressive scales (7.92 + 2.88. 8.92 + 3.34 and 9.69 + 2.85 respectively), while controls showed lower scores on these scales (5.38 + 3.7 , 7.46 +

2.05 and 7.38 ± 2.62 respectively) with significant differences between both groups ($P < 0.01$, < 0.05 , < 0.05 respectively). Other items of MHQ showed no significant difference between both groups.

Table (2) : presents differences according to the presence or absence of repeated hypoglycemic attacks.

Memory Processes Scale :

Diabetics without history of hypoglycemia had better scores on retention and memory change with aging (29.62 ± 8.07 and 19.88 ± 3.87 respectively) than those with history of hypoglycemia (39.4 ± 9 and 22.6 ± 1.02 respectively) ($P < 0.01$, < 0.01 respectively).

Benton Visual retention Test :

Showed no significant differences between both groups.

Digit Span :

There was significant difference between both groups (mean $\pm$ SD 5.5 ± 1.02 and 4.2 ± 1.25 respectively), ($P < 0.01$) in forward recaling.

M.H.O. :

Diabetics with history of hypoglycemia had higher scores on depression (8.5 ± 2.5) than those without history of hypoglycemia (6.4 ± 2.8) ($P < 0.05$).

Table (3) : presents the differences according to the duration of diabetes.

Memory Processes Scale :

Individual judgment on memory change with aging among diabetics who have duration < 5 years (19.57 ± 2.38) showed less impairment than those having long duration > 5 years (22.5 ± 3.97), ($P < 0.01$).

Benton Visual Retention Test :

Showed no significant difference as regard the duration of diabetes.

Digit Span :

Showed also no significant difference.

M.H.Q. :

There was significant difference between diabetics with duration < 5 years (9.43 ± 2.31) and diabetics with long duration (6.17 ± 2.09) ($P < 0.001$).

Table (4) : presents differences according to the level of glycosylated haemoglobin.

Memory Processes Scale :

Diabetics who had glycosylated haemoglobin $> 10\%$ showed impairment in retention and remember of information (38.6 ± 8.53 and 40 ± 5.44 respectively) while those with Gly Hb A1C $< 10\%$ had better scores in retention and remember of information (30.13 ± 8.21 and 34.88 ± 8.85 respectively).

Benton Visual Retention Test :

In obtained correct score, diabetics with Gly Hb A1 C $< 10\%$ had higher score (4.63 ± 1.69) than those with Gly Hb A1 C $> 10\%$ (2.8 ± 1.37) ($P < 0.05$).

Digit Span :

Showed no significant differences between both groups.

M.H.Q. :

Diabetics with Gly Hb A1 C $> 10\%$ showed higher scores on anxiety and depressive scales (9 ± 2.7 and 8.65 ± 1.92 respectively), while those with Gly Hb A1 C $< 10\%$ had lower scores on the same items (5.63 ± 2.16 and 5.75 ± 3.34 respectively) ($P < 0.001$, < 0.05 respectively).

Table (5) : presents differences according to sex.

Memory Processes Scale :

Males had better scores on retention and remember of information (29.86 ± 8.87 and 34.29 ± 9.35 respectively) than females (37.5 ± 8.01 and 39.83 ± 4.91 respectively) ($P < 0.01$, < 0.05 respectively).

Benton Visual Retention Test :

Showed no significant differences between males and females.

Digit Span :

There was significant difference between males (3.71 ± 0.46) and females (3.33 ± 0.49) ($P < 0.05$) in backward recalling.

M.H.Q. :

Females had higher scores on anxiety and depression (8.17 ± 2.94 and 9.67 ± 2.43 respectively), while males had lower scores on anxiety and depression (5.86 ± 2.41 and 6 ± 1.97 respectively) ($P < 0.05$, < 0.001 respectively).

Table (1) Mean value $\pm$ SD of neuropsychiatric parameters in diabetic patients and control

<i>Parameters</i>	<i>Diabetics n = 39</i>	<i>Control n = 40</i>	<i>T</i>	<i>P</i>
<i>Memory processes scale</i>				
Recal	14.23 ± 3.73	14 ± 3.15	0.3	NS
Retention	33.38 ± 9.22	25.85 ± 6.95	4.07	< 0.001
Memory change with aging	20.92 ± 3.5	21.38 ± 3.27	0.6	NS
Remember	36.35 ± 8.04	28.77 ± 8.02	4.44	< 0.001
<i>Benton visual retention tests</i>				
Obtained error score	8.38 ± 2.85	5 ± 2.03	6.02	< 0.001
Obtained correct score	3.92 ± 1.8	7.15 ± 2.72	6.18	< 0.001
<i>Digit span</i>				
Forward	5.2 ± 1.02	6.62 ± 1.09	4.18	< 0.001
Backward	3.46 ± 0.51	3.54 ± 0.51	0.69	NS
<i>Moddle sex hospital questionnair</i>				
Anxiety	7.92 ± 2.88	5.38 ± 3.7	3.38	< 0.01
Phobia	8.31 ± 2.88	8.7 ± 1.56	1.05	NS
Obcession	8.59 ± 8.15	8.62 ± 2.23	1.45	NS
Hypochondrsis	8.92 ± 3.34	7.46 ± 2.05	2.34	< 0.05
Depression	6.96 ± 2.85	7.38 ± 2.62	2.51	< 0.05
Hystria	6.62 ± 3.24	6.5 ± 2.10	0.19	NS

Table (2) Mean value $\pm$ SD of neuropsychiatric parameters in patients with history of hypoglycemia (group I) and those without (group II)

Parameters	Group-I n = 15	Group-II n = 24	T	P
Memory processes scale				
Recal	15.4 $\pm$ 3.11	13.5 $\pm$ 3.96	1.67	NS
Retention	39.4 $\pm$ 9	29.62 $\pm$ 8.07	3.47	< 0.001
Memory change with aging	22.6 $\pm$ 1.92	19.88 $\pm$ 3.87	2.94	< 0.001
Remember	39.2 $\pm$ 6.39	35.38 $\pm$ 8.73	1.57	NS
Benton visual retention tests				
Obtained error score	9.25 $\pm$ 2.83	7 $\pm$ 2.86	1.55	NS
Obtained correct score	3.88 $\pm$ 1.30	4 $\pm$ 2.45	0.1	NS
Digit span				
Forward	4.2 $\pm$ 1.52	5.5 $\pm$ 1.02	3.2	< 0.001
Backward	3.4 $\pm$ 0.51	3.5 $\pm$ 0.52	2.06	NS
Moddle sex hospital questionnair				
Anxiety	8 $\pm$ 3.98	6.25 $\pm$ 1.67	1.83	NS
Phobia	9.8 $\pm$ 2.4	8.63 $\pm$ 2.28	1.63	NS
Obcession	8.8 $\pm$ 3.17	8.63 $\pm$ 2.98	0.17	NS
Hypochondrsis	9 $\pm$ 3.07	8.88 $\pm$ 3.55	0.11	NS
Depression	8.5 $\pm$ 2.25	6.4 $\pm$ 2.8	2.25	< 0.05
Hystria	7 $\pm$ 4.54	6.38 $\pm$ 2.16	0.6	NS

Table (3) Mean value $\pm$ SD of neuropsychiatric parameters as regarding the duration of diabetes melliyus

Parameters	Duration <5y n = 21	Duration >5y n = 40	T	P
Memory processes scale				
Recal	15 $\pm$ 4.14	13.33 $\pm$ 3.07	1.44	NS
Retention	33 $\pm$ 12.28	33.83 $\pm$ 3.49	0.3	NS
Memory change with aging	19.57 $\pm$ 2.38	22.5 $\pm$ 3.97	2.83	< 0.01
Remember	35 $\pm$ 9.96	38.84 $\pm$ 4.51	1.53	NS
Benton visual retention tests				
Obtained error score	3.43 $\pm$ 1.72	5.14 $\pm$ 1.76	1.05	NS
Obtained correct score	9.29 $\pm$ 3.04	7.33 $\pm$ 2.28	1.34	NS
Digit span				
Forward	5.57 $\pm$ 1.08	5.67 $\pm$ 0.97	0.18	NS
Backward	3.29 $\pm$ 0.46	4.17 $\pm$ 1.38	1.49	NS
Moddle sex hospital questionnair				
Anxiety	7 $\pm$ 3.16	6.83 $\pm$ 2.48	0.18	NS
Phobia	8.43 $\pm$ 2.38	9.33 $\pm$ 2.20	1.2	NS
Obcession	8.57 $\pm$ 2.68	8.83 $\pm$ 3.43	0.3	NS
Hypochondrsis	8.71 $\pm$ 3.90	9.17 $\pm$ 2.62	0.4	NS
Depression	9.43 $\pm$ 2.31	6.17 $\pm$ 2.09	4.7	< 0.001
Hystria	6.29 $\pm$ 3.58	5.83 $\pm$ 2.68	1.5	NS

Table (4) Mean value $\pm$ SD of neuropsychiatric parameters as regarding glycosylated hemoglobin

<i>Parameters</i>	<i>GHb-HBA1c</i> <i><10% n = 24</i>	<i>GHb-HBA1c</i> <i>≥10% n = 15</i>	<i>T</i>	<i>P</i>
<i>Memory processes scale</i>				
Recal	13.4 $\pm$ 3.96	14.75 $\pm$ 3.57	0.7	NS
Retention	30.31 $\pm$ 8.21	38.6 $\pm$ 8.53	2.03	< 0.05
Memory change with aging	20 $\pm$ 3.89	22.4 $\pm$ 2.13	1.56	NS
Remember	34.88 $\pm$ 8.85	40 $\pm$ 5.44	1.19	NS
<i>Benton visual retention tests</i>				
Obtained error score	8.13 $\pm$ 3.29	8.8 $\pm$ 2.01	0.39	NS
Obtained correct score	4.63 $\pm$ 0.49	2.8 $\pm$ 1.37	2.14	< 0.05
<i>Digit span</i>				
Forward	5.75 $\pm$ 1.11	5.4 $\pm$ 0.83	0.65	NS
Backward	3.63 $\pm$ 0.49	3.2 $\pm$ 0.41	1.7	NS
<i>Moddle sex hospital questionnair</i>				
Anxiety	5.63 $\pm$ 2.16	9 $\pm$ 2.7	4	< 0.001
Phobia	8.75 $\pm$ 2.15	8.6 $\pm$ 3.68	0.14	NS
Obcession	8.88 $\pm$ 2.72	8.4 $\pm$ 3.5	0.44	NS
Hypochondrsis	8.13 $\pm$ 3.17	8.6 $\pm$ 3.68	0.5	NS
Depression	5.75 $\pm$ 3.34	8.65 $\pm$ 1.92	2.17	< 0.05
Hystria	6.38 $\pm$ 2.16	7 $\pm$ 4.54	0.5	NS

Table (5) Mean value $\pm$ SD of neuropsychiatric as regarding sex

<i>Parameters</i>	<i>Males</i> <i>n = 21</i>	<i>Females</i> <i>n = 18</i>	<i>T</i>	<i>P</i>
<i>Memory processes scale</i>				
Recal	13.43 $\pm$ 2.84	15.17 $\pm$ 4.46	1.42	NS
Retention	29.86 $\pm$ 8.87	37.5 $\pm$ 8.01	2.82	< 0.01
Memory change with aging	20.71 $\pm$ 4.12	21.17 $\pm$ 2.68	0.42	NS
Remember	34.29 $\pm$ 9.35	39.83 $\pm$ 4.91	2.32	< 0.05
<i>Benton visual retention tests</i>				
Obtained error score	8.29 $\pm$ 3.18	8.5 $\pm$ 2.5	0.2	NS
Obtained correct score	4.29 $\pm$ 1.79	3.5 $\pm$ 1.76	0.8	NS
<i>Digit span</i>				
Forward	5.57 $\pm$ 0.93	5.67 $\pm$ 1.14	0.77	NS
Backward	3.71 $\pm$ 0.46	3.33 $\pm$ 0.49	2.48	< 0.05
<i>Moddle sex hospital questionnair</i>				
Anxiety	5.86 $\pm$ 2.41	8.17 $\pm$ 2.94	2.66	< 0.05
Phobia	8.57 $\pm$ 2.25	8.67 $\pm$ 2.43	0.18	NS
Obcession	7.71 $\pm$ 2.99	8.83 $\pm$ 2.68	0.95	NS
Hypochondrsis	8.57 $\pm$ 2.84	9.33 $\pm$ 3.88	0.69	NS
Depression	6 $\pm$ 1.97	9.67 $\pm$ 2.43	5.12	< 0.001
Hystria	8.71 $\pm$ 1.87	8.83 $\pm$ 3.11	0.14	NS

Discussion

The impact of diabetes on brain function and underlying cognitive abilities has only recently recognized (*McCall 1992*). The presence of psychiatric disorders in diabetic patients is particularly worrisome because of its potentially negative effects on metabolic control (*Lavigne and Faier, 1992*).

Diabetic patients in our study has some problems with memory, differing as a group from control subjects on many aspects of memory scale including retention of information ($P < 0.001$) and remember ($P < 0.001$), Benton visual retention tests ($P < 0.001$) and forward digit span ($P < 0.001$). These memory decrement in diabetics is likely to result from an interaction between metabolic abnormalities intrinsic to diabetes and diabetic specific complications.

Similarly, *Uberall et al., (1996)* ; *Joanne and Miguel, (1997)* and *Strachan et al., (1997)* found that higher cognitive function is frequently affected in adolescents with type-1 diabetes mellitus. While *Gaschwend et al., (1995)* and *Draelose et al., (1995)* reported that cognitive function in patients with type-1 diabetes mellitus was generally well preserved. This discrepancy may be related to the nature of the diabetic population studied and The size of the studied sample.

As diabetes mellitus carries a special risk for psychological disturbances beyond that attributable to any other chronic disease (*Northam et al., 1992*). Many psychiatric disturbances were found in our diabetic patients compared to control including hypochondorsis ($P < 0.05$), depression ($P < 0.05$) and anxiety ($P < 0.01$). *Tebbi et al., (1990)* found that general well being was

lower in type-1 diabetes mellitus. *Gavard et al., (1993)* ; *Kovacs et al., (1995)* and *Alan et al., (1997)* reported a significantly increased prevalence of depression in diabetic patients. *Gold et al., (1994)* found that patients with type-1 diabetes mellitus had tended to become more neurotic and less extraverted. Also, *Kyvik et al., (1997)* reported unexpected high rates of suicide among young men with diabetes mellitus.

However when we subgrouped the diabetic patients according to the presence and absence of repeated hypoglycemic attacks. Those with positive history showed more depressive scores ($P < 0.05$) and impairment of few aspects of memory scale including retention of information ($P < 0.01$) and memory change with aging ($P < 0.01$) and forward digit span ($P < 0.01$). As this scale is subjective so it depends on self reports about the efficacy of their memory which may be affected by their depression. These results are in agreement with *Kramer et al., (1998)* who suggested that previous episodes of hypoglycemic coma are not associated with permanent impairment of cognitive brain function, while *Bjorgaos et al., (1997)* and *Fanelli et al., (1998)* reported slight cognitive dysfunction in children and adults with type-1 diabetes mellitus who have experienced episodes of hypoglycemia. The latter group of authors examine the diabetic patients during the acute attack of hypoglycemia and that may be the cause of discrepancy .

Our diabetic patients showed impairment of memory change with aging ($P < 0.01$) with increase of duration of diabetes mellitus , also our results showed that diabetic patients with long duration had less score on depressive scale than those with short

duration. ($P < 0.001$). This may be explained as, with the increase of duration, patients became adjusted well to their condition and became more comfortable with having diabetes mellitus, patients experienced themselves as adapting better to diabetes mellitus over time (**Jacobson et al., 1997**). **Rayon and Williams, (1993)** and **Kramer et al., (1998)** stated that cognitive function is subclinically impaired in relation to the duration of the disease .

As regard metabolic control, uncontrolled diabetic patients reported more score on anxiety ($P < 0.001$) and depressive scale ($P < 0.05$) than controlled patients. Also uncontrolled diabetic patients showed impairment only in retention of information ($P < 0.05$) and Benton visual test ($P < 0.05$). **Gaschwend et al., (1995)** reported that cognitive function in type-1 diabetics was generally well preserved even at high blood glucose level. **Wiebe et al., (1994)** suggested that those who experience heightened anxiety display poorer metabolic control. **Kovacs et al., (1995)** found that psychological morbidity negatively affect blood glucose regulation.

Regarding sex, in our study females showed more psychiatric disturbances than males including anxiety, ($P < 0.05$) and depression ($P < 0.001$). Depression and anxiety in general population are more among females than males (**Kaplan and Sadock 1998**). In contrast to our results **Jacobson et al., (1997)** who found that males were to be more symptomatic on depressive-obsessive, compulsive, paranoid ideation and psychoticism, and no sex differences were found on the somatization, anxiety, hostility or phobic anxiety subscales. Also females showed impairment on memory scale only as regarding retention of information and remember ($P <$

0.01 , $P < 0.05$ respectively). These tests may be affected by depression which is higher among females than males, while objective tests showed no statistical significance except for backward repetition of digits ($P < 0.05$) and this may be due to the difference in the numbers between males and females .

In conclusion, we found that memory is mildly and selectively disturbed in adolescents with type-1 diabetes mellitus that may be attributed to their psychological disturbances. Further investigations using better driven measures, might also shed additional light on the effect of diabetes mellitus on the neuropsychology of different component of cognition .

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تداخل بعض الاضطرابات النفسية مع مرض السكر وعلاقتها بالذاكرة عند مرضى السكر

تمت هذه الدراسة بمستشفى الطلبة بجامعة الزقازيق على المترددين على العيادة الخارجية من مرضى السكر النوع الأول وتهدف إلى تحديد أثر الإصابة بمرض البول السكرى وبعض الجوانب النفسية على الذاكرة وأشتملت الدراسة على ٣٩ مصابا بالبول السكرى وأيضاً ٣٩ فرداً صحيحاً كعينة ضابطة وتم تقسيم المصابين حسب الجنس ، مدة المرض ، نسبة تشبع الهيموجلوبين بالجلوكوز وأيضاً وجود أعراض نقص السكر فى الدم إلى مجموعات . وقد تم تطبيق عدة اختبارات وهى مقياس عمليات الذاكرة واختبار بنتون للذاكرة البصرية واختبار إعادة الأرقام وكذلك استمارة مستشفى ميدل سيكس وقد أظهرت النتائج أن هناك فروقا ذات دلالة إحصائية فى الاحتفاظ بالذاكرة وتغير كفاءة الذاكرة مع تقدم العمر للذين لديهم تاريخ حدوث نوبات نقص السكر فى الدم وفى مدى الاحتفاظ بالذاكرة للمعلومات للمرضى الغير ضابطين لمستوى السكر بدمائهم وفى التذكر والاحتفاظ بالذاكرة بين الإناث دون الذكور وفى تغير كفاءة الذاكرة مع تقدم العمر فى المصابين بالمرض لمدة أكثر من خمس سنوات وفى اختبار بنتون للذاكرة البصرية وجد أن هناك فرقا ذو دلالة إحصائية فقط فى الدرجات الصحيحة الحاصل عليها بين المرضى الضابطين لمستوى السكر فى دمائهم عنه فى غير الضابطين وفى إعادة الأرقام صحيحة عند المرضى الذين لديهم تاريخ حدوث نوبات نقص السكر فى الدم وفى إعادة الأرقام بين الإناث عنهم فى الذكور وفى مقياس مستشفى ميدل سيكس وجد أن المرضى الذين عندهم تاريخ نوبات نقص السكر فى دمائهم والذين أصيبوا بالسكر مدة أقل من خمس سنوات لديهم تغيرات عالية فى الإكتئاب بينما المرضى الغير ضابطين للسكر وكذلك الإناث لديهم تغيرات عالية فى القلق والأكتئاب. ومما سلف يتضح أن مرض السكر وبعض الاضطرابات النفسية لها تأثير متوسط على الذاكرة فى مرض السكر من النوع الأول.