# Some Biochemical Effects of Diabetic Complications

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## Abstract:

The response of serum glucose, cholesterol, Acetylcholin-esterase and Glutamate Oxaloacetate Transaminase was examined in diabetic complications and cardiovascular patients. These disease an increasing in the level of cholesterol by (20.34%) of male in group 5. Also we are noted a significantly inhibited the activity of AChE in the serum by (76.8%) of male and (80.6%) of female in group 5 were suffering from diabetic, hypertension and Myocardial infarction patients in comparison with the control group, but there is an increasing in the level of GOT enzyme by (43.6%), (52.25%) of male group 4 and group 5 respectively in comparison with the control group.

The present results suggest that diabetic complications and cardiovascular changes AChE activity.

## Introduction:

Diabetes mellitus is currently considered a complex disorder of metabolism, which affects the use of all major nutrients. Lack and/ or deficiency of insulin causes non-availability of glucose in some tissues and excess in others, e.g. kidney and nervous tissue, which leads to altered metabolism of carbohydrate, protein and lipids (1). It is a life-long condition, which requires careful control if the individual is to live a full and normal life. In the long term, the disease may led to complications such as heart diseases, blindness and kidney failure, as well as Limb amputation and autonomic neuropathy (2). Neuropathy occurs in people with Type 1 and Type 2 diabetes due to metabolic changes associated with diabetes, severe neuropathy may cause weakness and unbalanced walking (3). Men have an added symptom such as on excretion, blood pressure and cholesterol level which signals that a person has higher risk for heart or blood vessel damage (4). So one of parameters to indicate this cases is measurement of the activity of acetyl cholinesterase enzyme (AChE) [EC.3.1.1.7], is a membrane bound enzyme found in all cholinergic neurons, plays an essential role in the regulation of the most physiological events involving the turnover of acetylcholin (5,6). This has been regarded as the most important biochemical marker of cholinergic transmission in the central nervous system (7). Brain and serum AChE activity is affect by various neurons diseases (8). So it is measured in chick (9) in animals (10) and in human (11). The purpose of the present study was to examine some of the biochemical effects especially in patients suffering from diabetic complications.

## Methods And Materials:

### Serum collection

Five ml of venous blood was collected after ١٢ hours of fasting from:

**A. Normal persons**

**1.Twenty-six normal persons (Control group)**

(١١ males and ١٥ females aged between ٢٢–٢٥ years), which were randomly selected from the university of Mosul students and the lecturers. Those who were donated their blood considered as a control group.

**B. Patients**

Five groups of patients who attending to (Al-Waffaa diabetic center) for diabetes mellitus patients in Mosul for the period from September ٢٠٠٣ to March ٢٠٠٤ were studied:

**2. Diabetic patients**

Forty-four patients (١٨ males and ٢٦ females).

**3. Diabetic and Hypertension patients:**

Thirty-two patients (٢٣ males and ٩ females).

**4. Diabetic and Myocardial infarction patients**

Twenty-four patients (١٣ males and ١١ females).

**5. Diabetic, Hypertension and Myocardial infarction patients**

Seventeen patients (٧ males and ١٠ females).

**6. Hypertension patients**

Twenty-eight patients (١٢ males and ١٦ females).

**Assays of parameters**

Blood glucose and cholesterol levels and the activity of GOT enzyme were determined using enzymatic methods. Randox kit for glucose oxidase method (12). PAP kit for cholesterol oxidase method(13). Randox kit for the activity of GOT enzyme (14).

Acetylcholinesterase activity was assayed using acetycholine iodide (7.5%) as a substrate (15).

**Statistical Analysis**

Results were expressed as a mean $\pm$ S.E. and estimation between the control and patients groups was determined by student's "t" test (16). The level of significance was at $p<٠,٠١$.

## Results and Discussion:

The mean values for glucose, cholesterol, AChE and GOT enzymes activity obtained from all groups are shown in table ١. The results of the present study showed a remarkable increasing effect on cholesterol level in male (group ٥) by (20.34%) in comparison with the controlled group. This increase could be due to activition in the hydroxy methyl glutaryl-CoA reductase (HMG-CoA reductase), this enzyme is necessary for cholesterol biosynthesis (17).

Type ١ & ٢ diabetic patients are at high risk of vascular disease. Diabetic patients with concomitant diabetic neuropathy are especially devoted to cardiovascular complications due to the presence of microalbuminuria of proteinuria that are potent inductors of

hypercholesterolemia. It has been established that HMG-CoA reductase inhibitors are preferable when can is established (18).

In this study, the activity of cholinergic neurotransmission following previous diseases was investigated by assaying serum AChE activity. The result depicted in table ١ was showed that, patients suffering diabetic, hypertension and Myocardial infarction (group ٥) significantly decreased which were compared to the controlled group. The percentage of (inhibition) decreasing the activity of AChE was (76.8%) (٨٠,٦%) respectively (group ٥). The inhibitory effect may be due to inhibited at the anionic site of AChE (19).

**Table 1**: Effect of Diabetic Complications on Glucose, Cholesterol, AChE and GOT

| . | Type | Gender | Glucose mmol/l | Change % | Cholesterol mmol/L | Change % | AChE ΔpH/30min | Inhibition % | GOT U/L | Change % |
|---|---|---|---|---|---|---|---|---|---|---|
| ١ | Normal control | M | ٦,١±٠,١ | – | ٥,٨±٠,١ | | ١,٤٠١±٠,١١ | - | ±٠,٢ ١١,١ | – |
| | | F | ٥,٥ ±٠,٢ | – | ٥,٢±٠,٢ | | ١,٣٢٥±٠,١٥ | – | ±٠,٢ ١٤,٠ | – |
| ٢ | Diabetic | M | ١٣,٨±٠,١ | ١٢٦,٢ | ٦,٥±٠,٢ | ١٢,٠ | ١,٢٠١±٠,١٠ | ١٤,٢ | ١٠,٤±٣ | -6.3 |
| | | F | ١٣,٦±٠,٣ | ١٤٧,٢ | ٥,٠±٠,١ | -3.8 | ١,٢٢٠±٠,٠١ | ٧,٩ | ١٤,٤±٢ | ٢,٨ |
| ٣ | Diabetic and Hyper-tension | M | ١٦,٥±٠,٥ | ١٧٠,٤ | ٦,٠±٠,٣ | ٣,٤ | ±٠,٢٠ ٠,٩٢٥٠ | ٣٣,٩ | ±٠,٣ ١١,٩ | ٧,٢ |
| | | F | ١٣,٠±٠,٢ | ١٣٦,٣ | ٥,٧±٠,١ | ٩,٦ | ٠,١٠٦±٠,٠٩ | ٢٠,٠ | ±٠,٢ ١٢,٦ | -10 |
| ٤ | Diabetic & Myocardial Infraction | M | 13.28±0.2 | ١١٧,٧ | 5.33±0.23 | -8.10 | 1.096±0.09 | ٢1.77- | 15.9±0.6 | *43.6 |
| | | F | 15.31±0.1 | 178.3 | 5.36±0.14 | 3.07 | 1.014±0.041 | -23.47 | 12.5±0.2 | -10.2 |
| ٥ | D & H.T & M.I | M | 15.21±0.2 | 149.3 | 6.98±0.13 | 20.34 | 0.325±0.06 | *٧٦,٨ | 16.9±0.6 | *٥٢,٢٥ |
| | | F | 13.8± 0.02 | ١٥٠,٩ | 5.9±0.05 | ١٣,٤٦ | 0.256±0.03 | *٨٠,٦ | 15.1±0.4 | 7.85 |
| ٦ | Hyper- tension | M | ٥,٨±٠,١ | -4.9 | ٦,١±٠,٢ | ٥,١ | ١,٢٥٠±٠,١٨ | ١٠,٧ | ±٠,٢ ١٢,٢ | ٩,٩ |
| | | F | ٥,٥±٠,١ | ١,٨ | ٥,٥±٠,١ | ٥,٧ | ١,٢٤٥±٠,١٧ | ٦,٠٣ | ±٠,٣ ١٣,٠ | -7.1 |

M=Male, F=female

* Refers to significant at p<٠,٠١ compared with the control group.

The values are mean ± SE.

On the other hand, many reports suggest that such inhibition is due to a decrease in the internal microviscosity of phospholipids leading to changes in the fluidity of microsomal membranse of the brain (20). While table ١ was indicated that there is an increasing effect on the serum GOT activity by (43.6%) (52.25%) of male group ٤ and group ٥ respectively. This increasing may be due to the patients who suffering cardiovascular disease associated with diabetic, this induced a cell damage in heart soresulting in leakage of GOT enzyme into the serum (21).

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# بعض التأثيرات الكيميوحيوية لمضاعفات داء السكر

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**الملخص:**

يتضمن البحث دراسة تأثير بعض المتغيرات الكيموحيوية كمستوى الكلوكوز والكوليسترول وفعالية أنزيمي الاستيل كولين استريز وكلوتاميت اوكزالواسيتيت ترانزامينيز في مصل الدم للمرضى المصابين بمضاعفات داء السكر ومرضى الاوعية الدموية القلبية. أظهرت النتائج زيادة مستوى كوليسترول الدم للمرضى الذكور للمجموعة الخامسة المصابين بمضاعفات داء السكر المترافق مع ارتفاع ضغط الدم والذبحة القلبية بواقع (٢٠,٣٤%) بالمقارنة مع المجموعة الضابطة. وبينت النتائج انخفاض وبشكل معنوي لفعالية انزيم الاستيل كولين استريز لمرضى المجموعة الخامسة من الذكور والإناث بواقع (٧٦,٨%) و(٨٠,٦%) على التوالي. كما لوحظ زيادة مستوى فعالية أنزيم كلوتاميت اوكزالواستيت ترانزامينيز بواقع (٤٣,٦%) و(٥٢,٢٥%) لذكور المجموعة الرابعة والخامسة على التوالي مقارنة مع المجموعة الضابطة. توحي هذه النتائج بان مضاعفات داء السكر يغير من نشاط أنزيم الاستيل كولين استريز.