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# MEASURING the LEVEL of FUCOSE AND SOME ANTIOXIDANTS and MEASURING SOME BIOCHEMICAL VARIABLES in the BLOOD of PATIENTS with TYPE II DIABETES

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***Abstract**:*
**The study aimed to find out the effect of type II diabetes on fucose and some values of antioxidants compared to healthy people, as 30 blood samples were collected from patients with type II diabetes, their ages ranged from 30-55 years, while 20 blood samples were collected from healthy people of the same age group and for both sexes., Where the fucose level was measured, a significant increase was found in the patient group by 0.01 compared to healthy people, and the efficacy of the enzyme catalase was measured, and a significant decrease was found at the probability level of 0.05. Also, glutathione recorded a decrease of 0.01 in patients with diabetes mellitus compared to healthy people, while vitamin C, Malondialdehyde and Peroxynitrite were recorded. An increase in the patient group compared to the healthy group at the 0.01 level.**
**While vitamin A and Glutathione-S-transferase were increased in the group of patients compared to the healthy group, with the probability level 0.05.**
**The study also included the measurement of urea, creatinine, uric acid and basic phosphatase. Urea, creatinine, and basic phosphatase all recorded an increase in the group of people with type II diabetes at a probability level of 0.01 compared to the healthy group, while uric acid recorded a significant decrease at the probability level 0.01. compared to healthy controls.**

***Key words: type II diabetes, fucose, antioxidants, biochemical variables..***

## INTRODUCTION

The diabetes disease is a disorder of metabolic condition characterized by elevate in levels of glucose beyond the normal range that lead to destruction of tissues, damage with dysfunction of various organs and systems [1], especially cardiovascular system, the eyes, kidneys, nerves system [2]. The human body breaks down and digestion the food into fundamental nutrients that body tissues needed. for example glucose which is subsequently absorbed by digestive tract then produce and released into bloodstream, that lead to elevate levels of glucose in blood, that resulting in a pancreas to synthesis and produce the insulin and transported form site of production to bloodstream, and it is worth noting that insulin enables cells to the glucose utilize, the lack of secretion of insulin from beta cells in the pancreas or the weakness of its mechanism of action, or both together, or a defect in the insulin receptors as a result of genetic or environmental disorders (3) The genetic predisposition, advancing age, stress, and sudden shocks have an effective effect on the onset of the disease, in addition to the indirect hormonal effect, as catabolic hormones increase when stress increases (4). Diabetes is also

sometimes attributed to an increase in the secretion of antibodies to the action of insulin from body cells or antibodies of the pancreas, and the beta cells are broken down, so the level of glucose in both blood and urine increases, and the metabolism of fatty and protein substances is disturbed, which increases the amount of ketone bodies in the blood (5) The reason for the increase in the level of blood sugar is due to a disturbance in the metabolism of glucose, which does not convert into glycogen or is not oxidized to CO2 at normal speed, and since glucose is not consumed, it accumulates, especially after meals rich in carbohydrates (6) Note that the insulin hormone secreted by the pancreatic gland has an effective effect on glucose oxidation, as insulin stimulates an increase in the transfer of glucose to the skeletal muscles and liver and accelerates the use of glucose to form glycogen and fat, the decrease in the secretion of the hormone insulin from the pancreas leads to elevate in the glucose level and then diabetes (7) Diabetes mellitus of the second type, which is characterized by the fact that the infection occurs at different ages, but it is most common after the age of forty, so it is called adult diabetes and is the most prevalent of the first type if it includes approximately 80-90% of patients with diabetes (8) and the term diabetes Non-insulin dependent is used for people who have insulin resistance or relatively deficient secretion of this hormone (9) L-fucose, which is one of the eight basic sugars that the body needs for a typical cell-to-cell communication function, the (L) form is main form of sugar while the (D) form is the synthetic counterpart of fucose (10).

Antioxidants are any substance when appear in low concentrations compared to basic oxidizing substances that works to remove or inhibit the oxidation process of the base material (11) The active substances of oxygen in the normal state are removed from the body by the defense systems of antioxidants and thus protect the body from oxidative stress (12)

**PRACTICAL PART**

20 blood samples were collected from normal cases for both sexes. As for the samples of patients with type II diabetes, they were collected from Samarra General Hospital for the period from October to December after being diagnosed by specialized doctors on the basis of checking blood sugar levels, as 30 blood samples were collected for both sexes, whose ages ranged between 30-55 years.

The blood was drawn from the vein using a single-use 5 ml plastic syringe and the blood was placed in clean plastic tubes with a size of the blood serum separated from the coagulated part, and then the serum was withdrawn by a micropipette, after which the enzyme activity was measured directly and the sample was kept in freezing for the purpose of Make other required measurements.

1- Determination of the level of fucose in the blood serum

The principle or base on which this method is the direct interaction of sulfuric acid with components of serum. Reaction is associated with cysteine, and product of color is measured at the wavelength 390-430 nm, depending on (13).

2- Estimating the activity of the enzyme catalase in the blood serum: the activity of the enzyme arginase was estimated according to (14)

3- Glutathione-S-transferase (GST) was estimated (15).

4- Vitamin A rating, was estimated (16)

5-Vitamin C, was estimated (17)

6- Glutathione: measure according (18)

7- Malondialdehyde (19)

8- Peroxynitrite (20)

9- Some biochemical parameters were measured and include:

9.1- Determination of serum basal phosphatase concentration (21)
2-9- Urea, creatinine and uric acid from Biolab

## RESULTS AND DISCUSSION

Table No. (1) shows the Mean ± standard deviation of some antioxidants in the serum of patients with type II diabetes compared to healthy controls.

| Parameter | Controls (G1) Mean ±SD | Diabetics Patients (G2( Mean ±SD | P< |
|---|---|---|---|
| Catalase (U/ml) | 190±32 | 130±17 | 0.05 |
| GST U/L | 17.04±2.21 | 20.30±1.2 | 0.05 |
| Vit. A µmol/L | 1.3±0.1 | 1.9±02 | 0.05 |
| Vit. C µmol/L | 43.1±3.1 | 30.12±4.2 | 0. 01 |
| Clutathione µmol/L | 15.2±1.3 | 5.1±1.3 | 0.01 |
| **Malondialdehyde (µmol\ml)** | 4.1±0.07 | 5.6±0.9 | 0. 01 |
| **Peroxy nitrite (µmol\ml)** | 73.5±8.2 | 92.9±6.8 | 0.01 |

It is evident from the above table that the activity of the enzyme catalase decreased in the group of patients with type II diabetes compared to the healthy group.

The results showed a significant increase in the effectiveness of the GST enzyme compared to the healthy group, due to the increase in oxidation in large quantities inside the body, leading to an increase in the production of harmful compounds resulting from fat oxidation or protein, and then increasing the enzyme's effectiveness to remove these compounds (22).

The current results for vitamin A control agree with Tietz et, al. (23) for normal control, while the current results do not agree with (O Brien et, al) (24) for the group of patients with type II diabetes.

The results of the current study regarding vitamin C in the group of patients with type II diabetes agree with the findings of (Tessier , et, al) (25) that this decrease confirms the occurrence of oxidative stress as it works to protect the cell from damage (26).

The results of the current study agree with the findings of (Chugh et.al) (27) for type II diabetes, and the decrease is due to the effective participation of glutathione in preventing oxidative stress in the case of oxidative stress (28).

As for Malondialdehyde, the results of the current study are in agreement with the findings of (Chugh et.al) (27) that an increase in diabetes patients indicates lipid peroxidation, and a high blood sugar level leads to an increase in the formation of free radicals (29).

The results of the current study agree with the findings of (Maurya et.al) (30) with regard to peroxynitrite in type II diabetes patients, and the reason for the increase is due to the presence of a negative oxygen radical, as the peroxynitrite radical consists of the interaction of the negative oxygen radical with the NO radical (31)

Table No. (2) shows the Mean ± standard deviation in the group of people with diabetes compared to healthy controls

| Parameters | Mean ± S.D. Control (G1) | Mean ± S.D. Patients (G2) | P< |
|---|---|---|---|
| **fucose** mg/dl | 10.2±0.3 | 14.41±0.23 | 0.01 |
| ALP U/L | 41.26±1.8 | 98.06±4.6 | 0.01 |
| Urea mg/dl | 16.31±4.55 | 27.22±2.1 | 0.01 |
| Crietanin mg/dl | 0.77±0.2 | 1.15±0.077 | 0.01 |
| Uric acid mg/dl | 3.27±0.8 | 2.1±0.4 | 0.01 |

We note from the above table that fucose significantly increased in the group of people with type II diabetes compared with the healthy group at the level of probability 0.01The reason for this is the increase in fucose by increasing the activity of the enzyme fucosetransfase that release fucose GDP and then fucose binds to Lipids and protein (32)

When comparing the level of activity of the enzyme ALP in the blood serum of patients with its level in the sera of healthy people, it was observed that there was an increase in the activity of the enzyme with a high significant value.

At a probability level (0.01 ≥P) in patients with diabetes, as shown in Figure (2), and the results generally indicate an increase in the activity of the enzyme ALP in the blood serum of people with diabetes, as in the study of Al-Sherifi (33) as it showed an increase in the activity of the enzyme ALP in the blood serum of people with diabetes. And (Shaheen et al.) appeared (34)

There is an increase in the level of serum ALP in patients with diabetes, this elevate in ALP efficacy is due to different conditions like liver disease, gallstones presence and ALP elevation may indicate diseases of bone like Osteopenia or Osteoporous, as well as causing disorders of the blood also had an increase in ALP (35).

The findings of the current study demonstrated an elevated in the level of urea and creatinine for people with type II diabetes compared to the healthy group, and this is consistent with the findings (36) and the reason for this is the high level of urea in the blood in the event that there is a rise in the level of blood sugar in a diabetic patient and It indicates kidney damage. Studies have found that increased urea and serum creatinine in mice with diabetes indicates progressive kidney damage. [37] Creatinine in the blood is a more sensitive indicator of kidney function compared to the level of urea in the blood.

The findings of the current study demonstrated a significant reduce in uric acid in the group of people with type II diabetes compared to the healthy group, and this is consistent with the findings (38)(40).

The reason for this is that uric acid is one of the antioxidants that have the ability to inhibit the lipid peroxidation process, thus reducing oxidative stress (39)(41).

## REFERENCES

[1] Ene, A.C.; Nwankwo, E.A. ; Samdi , L. M. (2007) . Alloxan-Induced Diabetes in Rats and the Effects of Black Caraway (Carum carvi L.) Oil on Their Body Weight . Res. J. Medicine and Med. Sci., 2(2), 48-52.

[2] Jayasri, M.A. ; Gunasekaran, S.; Radha, A. ; Mathew, T. L. (2008). Anti-diabetic effect of Costus pictus leaves in normal and streptozotocin-induced diabetic rats. Int. J. Diabetes and Metabolism., 16, 117-122.

[3] Crespilho, D.M; Leme, J.A.C.A; Mello, M.A.R. and Luciano, E. (2001).Effects of physical training on the immune system in diabetic rats .Int.J.Diab. Ctries., 30 :233-240.
[4] Al-Zuhairi, Abdullah Muhammad Dhanoun. (1992). "Human nutrition." Dar Al Kutub for Printing and Publishing, University. Mosul / Iraq: 60-52
[5] Allen, D. E. (2003). The manual of diabetes education. Navigating Diabetes center. New York. U.S.A.
[6] Hirschhorn, J.N. (2003).Genetic epidemiology of type 1 diabetes. Pediatr Diabetes, 4: 87-100.
[7] Crespilho, D.M; Leme, J.A.C.A; Mello, M.A.R. and Luciano, E. (2011).Effects of physical training on the immune system in diabetic rats .Int.J.Diab. Ctries., 30 :233-240.-78
[8] Al-Turki, Y. A. (2000). The prevalence of overweight and obesity amongst hypertensive and diabetic adult patients in primary health care. Saudi Med. J., 21(4): 340-343.
[9] Walter, J.B; Talbot, I.C; Garadner, H.A; Halloran, P.F; Zucherman, M; Bird, A.G. and Forbes, A. (1996). General Pathology. 7thed. Churchill Livingston, London. U.K. PP: 591-690.
[10] Ashour, Lamia Shaker, Ghani Zainab Qasim. Measuring the level of fucose and some other variables in the blood serum of type II diabetics. Ibn Al Haytham Journal of Pure and Applied Sciences, Issue 2, Volume 22, 2002
[11] Suga , T., Watanabe , T. , Matsumoto , Y . and Horie , S. , Biochemica et Biophysica Acta. , 794:218-224 (1984) .
[12] Sekhon, L.H.; Gupta, S.; Kim. Y.; Agarwa, A. (2010). Female infertility and antioxidants current women's health. Reviews. 6,2.
[13] Aref Sarwat Ibrahim, Khurshid Sabah Ibrahim. Study of the enzyme level of rinin and Alpha-L-Fucose and some biochemical variables for patients with chronic renal impairment, Tikrit Journal of Pure Sciences, Issue 18, Volume 5, 2013-
[14] Abi,H.(1974). Method of enzymatic analysis. New York Academic press ,2:674-684.
[15] Green, M.J. and Hill, H.A.O. Chemistry of dioxygen. Methods Enzymol. 1984; 105:15.
[16] Wootton .I.D.P;Microanalysis in Medical Biochemistry .Heather Freemann 6th ed.Edinburge.london .pp.236-237.
[17] stanley,T;David .and Howerds,S;Selected Method for the Determination of Ascorbic Acid in Ainmal Cells ,Tissues and Fluid .Method in enzymeology .Acad press ine;N.Y.Vol.62.pp.6-9 Vitamins and Coenzymes part D.
[18] Sedlak, J. and Lindsay, R. H. "Analytical biochemistry" 1968 p.192 . cited by Al-Zamely(2001). Al-Zamely, O. M.; Al-Nimer, M. S. and Muslih, R. K. Detection the level of peroxynitrite and related with antioxidants status in the serum of patient with acute myocardial infraction . Natl. J. Chem .2001; 4: 625-637.
[19] Yoshiji Ohta Mutsumi Kongo Teruaki Kishikawa. Effect of melatonin on changes in hepatic antioxidant enzyme activities in rats treated with α - naphthylisothiocyanate First published: 07 July 2008 Rineal Researh
[20] Rico, M. G.; Puchades, M.J.; Ramón, R. G.; Sáez, G.; Tormos, M.C. and MiguelA.(2006): Effect of hemodialysis therapy on oxidative stress in patients with chronic renal failure. Nefrología, 26(2):218-225.
[21] Saleh Nadia Ahmed. Determination of urea, creatinine, uric acid, basic phosphatase, phosphorous, calcium and total protein in the blood of persons with acute renal insufficiency in Tikrit city. Tikrit Journal of Pure Sciences, Issue 1, Volume 17, 2013
[22] Stella, L.; Pallottini, V.; Moreno, S.; Leoni, S.; DeMaria, F.; Turella, P.; Federici, G.; Fabrini, R.; Dawood, K.F.; Bello, M.L.; Pedersen, J.Z. (2007). Electrostatic association of glutathione transferase to the nuclear membrane .evidence of an enzyme defense barrier at the nuclear envelope. J. Biol. Chem. 282, 6372–6379.

[23] Tiezta,NV.1999.Texbook of clinical chemistry ;W.B Sunders Company Philadelphia; pp 490-491,pp1000-1025.
[24] Obrien S,F .wus ,GG .Powrie ,J,K.shaw K,M and Miller N,J 1996 lipied lipoprotein antoxandant and Glomerula and Tabular Dysfaction in type l Diabetes .Res .clin part Vol 32 ,no 12,pp 81-90
[25] Tessier,D; Khail;A and Fulop,T.1999. Effact of An orall glucose challenge on frre readical anit ioxidant Balans in older population with type ll Diaberts .J,Gerontol.ser,A.Biol,sc; vol.54.No.11 ;pp541-545.
[26] Gillham, B.; Papachristodoulou, D.K.; Thomas, J.H. (2000). "Wills` Biochemical Basis of Medicine". 3rd ed. Butterworth-Heinmann.UK.
[27] chugh.S.N.Dhwan,R.Kishor.K,sharma A,and Chugh; K 2001 .chlibenelamide Gliclazide in Reducing Oxidation Stress in patient of Non Insulin Depanted Diabtest Mllitus A Double Bind Randomized study.J,assco,phys.Indis,Vol,49,pp803-807.
[28] Rizzo, A.M.; Berselli, P.; Zava, S.; Montorfano, G.; Negroni, M.; Corsetto, P.; Berra, B. (2010). Endogenous antioxidants and radical scavengers. Adv. Exp. Med. Biol. 698, 52.
[29] Ramadan, J.; Telahoun, G.; Al-Zaid, N.S.; Barac-Nieto, M. (1999). Responses to exercise, fluid, and energy balances during ramadan in sedentary and active males. Nutr. 15, 735–739.
[30] Maurya, P.K.; Rizvi, S.I. (2009). Alterations in plasma nitric oxide during aging in humans. Indian. J. Biochem. Biophys. 46(1),130-2.
[31] Denicola, A.; Radi, R. (2005). Peroxynitrite and drug-dependent toxicity. Toxicology. 208(2), 273–288.
[32] Clay , F.; Semen Kovich , J. W . and Heineke, J.W., (1997). and Heineke J . W . , (1997) . Diabetes . 46 : 327-323.
[33] Al-Sharifi, Ghask Abdul-Jabbar (2000) “A biochemical study of total base phosphatase and high molecular weight basic phosphatase purified from sera of persons with diabetes” Master Thesis, College of Education for Girls / University of Tikrit.
[34] Shaheen, A., Khattak, S., Khattak, A. M., Kamal, A., Jaffari, S.A., Sher, A.(2009) "Serum alkaline phosphatase level in type II diabetes mellitus and it's relation with periodontitis" Kust Medical Journal; 1(2): 51 – 54.
[35] Kumar , V., Abbas , A .K., Fausto, N. and Aster , J .(2009)."Robbins and cotran pathologic basis of disease ".18th ed .
[36] Khorshid, Sabah Hussain. Al-Karawi, Issam Nuri Salman. Ali, Ali Abbas. Estimating the level of homocysteine in patients with diabetes (type II) and its relationship to body weight Vol: 11 No Diyala Journal of Pure Sciences,: Volume 11, Issue 1, 2015.
[37] Abeer J. Hassan. Relations of high sensitive C-reactive protein (hs-CRP) with microalbuminuria as a useful predictor of cardiovascular risk among type 1 diabetes mellitus patients. J. Fac. Med. Baghdad. 2016; 1(58).
[38] Perrone, R. D.; Madias, N. E.; Levey, A. S. Serum creatinine as an index of renal function : new insight into old concepts. 1992; 38 ( 10).
[39] Johnson R J; Feig D I; Herrera-Acosta J and Kang DH. 2005. Resurrection of uric acid as a causal risk factor in essential hypertension. Hypertension 45: 18–20.
[40] Mahal, M. H., Hussein, A. L., Mohammed, H. E., Thamer, H. A., & AL-Samarraie, M. Q. EFFECT OF AQUEOUS EXTRACT OF GRAPE SEEDS ON THE CERTAIN BIOCHEMICAL PARAMETERS IN FEMALE MICE WITH HYPERPROTEINEMIA INDUCTION. Biochem. Cell. Arch. Vol. 19, Supplement 1, pp. 2525-2529, 2019.
[41] Mustafa, H. A., Majid, H. H., Abdulqader, A. T., Mustafa, M. A., & Salih, A. A. Study On Some Physiological, Biochemical And Hormonal Parameters Of Seminal Fluid Of Infertile Men. Biochem. Cell. Arch. Vol. 19, Supplement 1, pp. 1943-1947, 2019.