Study of levels of vit-C, albumin and uric acid as a component of total antioxidants defens system in type- 2 diabetic patient

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Abstract

This study was carried out in 38 hospitalized patients with uncontrolled type 2 diabetes mellitus and in 38 apparently healthy individual to assess the changes in antioxidants (vit –C, albumin, uric acid) as component of of total antioxidant defense system . The results showed a marked reduced significantly ($P < 0.01$) in levels of (vit – C, albumin) and significant increased ($P < 0.05$) in levels of uric acid in uncontrolled type 2 diabetes , as in healthy individual. Though good control of blood glucose with antioxidant therapy could help in reducing free radical activity and minimize major complications in diabetic patients.In diabetes,the persistence of hyperglycemia has been reported to cause increased production of oxygen free radicals through glucose autooxidation and nonenzymatic glycation.The aim of this study was to determine the changes in antioxidants like (vit – C, albumin, uric acid) as component of total antioxidant defense system in type 2 diabetic patients.

الخلاصة

تم دراسة 38 مريض من النوع الثاني من داء السكري و38 من الاصحاء كمجموعة سيطرة حيث تم قياس مستويات مضادات الاكسدة (فيتامين – سي ، البومين ،وحامض اليوريك)كاحد مكونات النظام الدفاعي،وقد اظهرت النتائج انخفاض مهم ($P < 0.01$) في مستويات فيتامين – سي والالبومين وارتفاع في مستويات حامض اليوريك لدى مرضى السكري من النوع الثاني بالمقارنة مع مجموعة السيطرة

Introduction

Antioxidants can be defined as any substances that when present in low concentration compared to those of an oxidiazable substrate , significantly delay or inhibit oxidation of that substrate [1] .The antioxidant defense system of the body has many components including metal binding proteins such as transferrin, ferritin , ceruplasmin and albumin , which are considered as a primary antioxidant . These binding proteins work by reducing the availability of metal ions which play an important role in free radical formation .Also there are enzymatic antioxidants as superoxide dismutase (SOD) catalase(CAT) and nonenzymatic antioxidant defense systems involving small molecules such as vit-C ,vit-E ,uric acid and bilirubin these act to scavenge free radicals and prevent them taking part in reactions which could cause cell damage .A deficiency in any of these components can cause a reduction in the overall or total antioxidant status (TAS) of an indivdual [2] .Total antioxidant status may be used as an important tool for screening the identification of risk factors

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in patients and as monitoring tool for assessing the effect of drug treatment regimes[3] (TAS) measure the contribution to plasma antixidants like enzymes, proteins ,and small molecules like uric acid[4] .In diabetes , the persistence of hyperglycemia has been reported to cause increased production of oxygen free radicals through glucose autoxidation and nonenzymatic glycation . The measurment of antioxidants in type 2 diabetic patients is thus a useful indicator of risk from diseases associated with free radicals activity , and may indicated the need for antioxidant therapy(4) .

Materials and methods

Thirty – eight patients (28 men and 10 women) were included in the study. Their mean age was(50± 1) years (range 40 to 60 years).All had attended to Al- Dywania teaching hospital for follow – up clinics over one month period and all fulfilled the following three criteria :(1)Fasting plasma glucose (≤ 550 mg / 100 ml)

patient as compared with control group (0.385±0.041).A significantly decreased' ($p<0.01$) in serum albumin concentration (2.8 ±0.59) has been shown in Fig (2) in diabetic patient than control group (4.33 ± 0.66). Serum uric acid levels were significantly increase ($P<0.05$) in diabetic patients (107.15 ± 19.93) as Compared with control group (61.88 ±16.74) Fig (3). (FSG) concetration was inversely and significantly related with serum vit- C concetration ($r = -0.613$) ($P<0.05$) Fig (4).It was also inversely and significantly related with serum albumin concetration ($r = -0.419$) ($P<0.05$) Fig(5).while the correlation between serum uric acid levels and (FSG) was found non significant
($r = -0.22$)($P = -0.08$).

Table (1) The mean and standard deviation of variables (glucose, Vit – C, uric acid, albumin,) in both type 2 diabetic Patients and contr

Parameter	Groups		
	Patients n=38		P - Value
FSG	230.57 ±111.31	88.28 ±5.54	< 0.01
Vit – C (mg /100ml)	0.385± 0.041	0.255 ± 0.05	< 0.01
Uric acid (mg /L)	61.88.±16.74	98.15 ± 19.93	< 0.05
Albumin (.g / 100 ml)	4.33 ± 0.66	2.8 ± 0.59	< 0.01

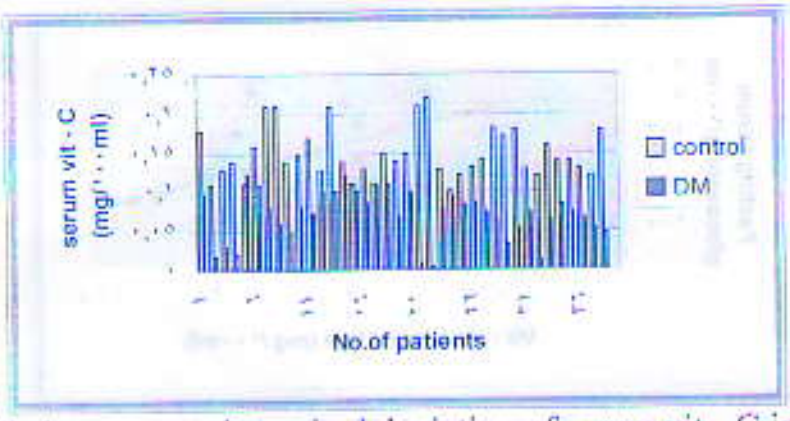

Fig (1) the mean and standard deviation of serum vit - C in type 2 Diabetic patients (DM) (n =38) and control (n = 38).

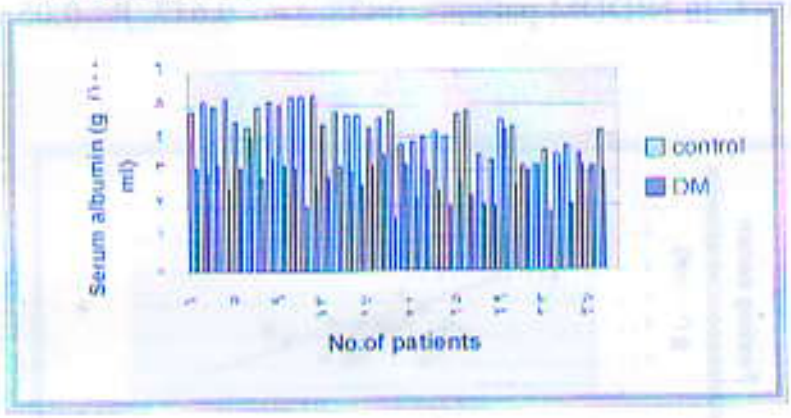

Fig (2) the mean and standard deviation of serum albumin in type 2 Diabetic patients (DM) (n = 38) and control (n = 38).

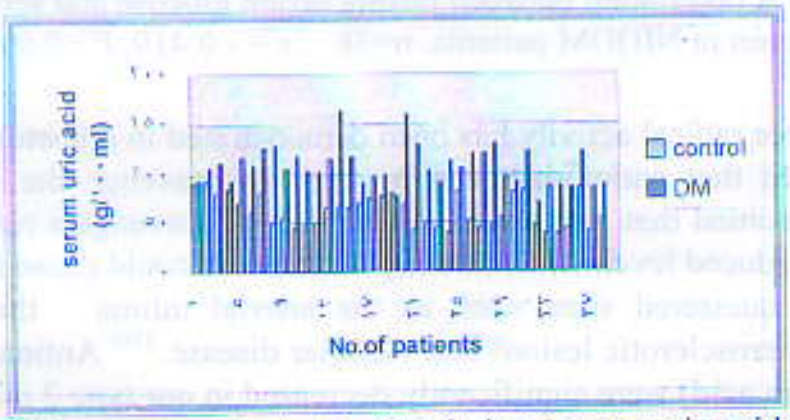

Fig (3) the mean and standard deviation (serum uric acid in type 2 Diabetic patients (DM) (n =38) and control (n=38).

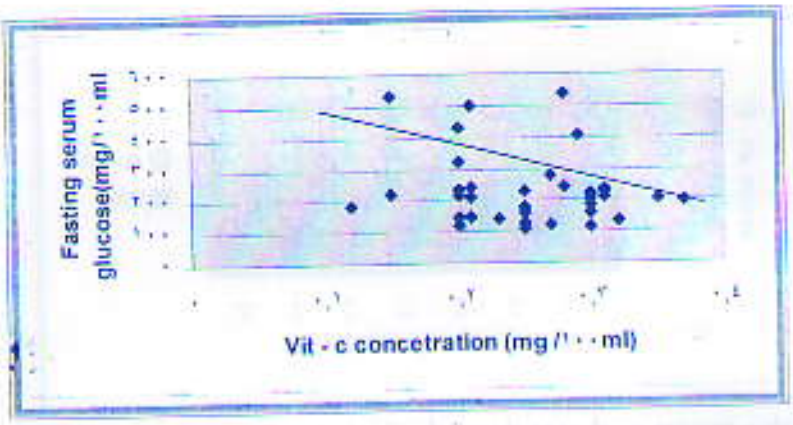

Fig (4) A correlation between fasting serum glucose and serum Vit – C in NIDDM patients. n=38, r = - 0.613, P< 0.05

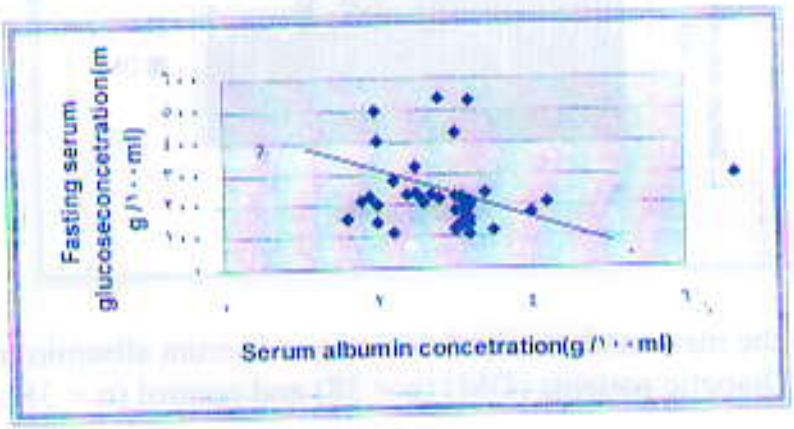

Fig (5) A correlation between fasting serum glucose and serum albumin in NIDDM patients. n=38 , r = - 0.419, P <0.05

Discussion

Increased free radical activity has been demonstrated in diabetes mellitus [9] .It has been suggested that antioxidant can be used to scavenge the increased free radicals. It was assumed that low levels of free radical scavengers reflect increased oxidative stress .Reduced levels of circulating antioxidant could cause increased lipid peroxidation in sequestered sites, such as the arterial intima this favours the development of atherosclerotic lesions and vascular disease. [10] Antioxidants such as (vit C, albumin, uric acid) were significantly decreased in our type 2 diabetic patients These findings suggest the existence of low antioxidant defense in these patients, which may be due to:

-lower dietary intake of antioxidants such vitamins A, C and E and sulphur containin g amino acids such as methionine in the diet.

- More utilization of these antioxidants to remove excess free radicals produced by diabetes mellitus [9] other sources could include auto-oxidation of glucose [11] and non enzymatic glucation [12]. In diabetes plasma glucose is high and there are more

chances of excess free radicals production, causing significant decrease in total antioxidant status [4]. Our results for diabetic patients appeared to support most previous studies in finding that persons with diabetes mellitus have lower serum vitamin C concteation than that without diabetes (P<0.01)Fig(1).Of[23] studies reviewed previously only 7 found that blood vitamin C concetration not significantly lower in diabetic persons than conceration in persons without diabetes[13]Several explanations for reduced serum vit - C concetration in persons with diabetes might considered:

1- Renal reabsorption of vitamin C may be reduced by hyperglycemia .
2- Blood glucose may compete with vitamin C for uptake into certain cells and tissues.
3- Cellular reglution of vitamin C may be impaired.
4- Increased oxidative stress may deplete antioxidant reserves.

This study suggests that increasing antioxidant protection against free radicals may possibly reduce complications in type-2 diabetic patients. Indeed ,antioxidant supplements such as vitamins A,C and E may achieve these aims [14] good controls of plasma glucose in type 2 diabetic patient could also reduce free radicals activity and the risk of complication [15] Our results for type 2 diabetic patients show that low serum albumin concetration associated with diabetes(P<0.01) Fig(2). Poorly controlled diabetes is associated with altered body metabolism [16] Insulin – mediated net protein anabolism occurs largely in skeletal muscle wasting [17]. Similarly decreased synthesis of hepatic plasma protein (eg. albumin) has been show in diabetes [16, 18] low serum albumin concentration were associated with diabetes. The treatment of diabetes with insulin ,greater energy intake,and inflammation were associated with low serum albumin concentration [19]similar associations between diabetes and low serum albumin were found by using data derived from NHANES [20]. These findings suggest the twice risk of low serum albumin concetrations observed in diabetic patients.Fig (5). In the present study,we found high levels of serum uric acid to be significant (P <0.05) in related to fasting serum glucose in diabetic patients Fig(3). Raised serum uric acid levels are commonly associated with high blood pressure [21] obesity [22] non insulin dependent diabetes mellitus [23] and glucose intolerance [24] Hyper insulinemia are often associated with hyper uricemia or hyper tension [23, 25]. Insulin is related to serum uric acid level [25] and also increased sodium reabsorption through a direct action on the proximal tubule [26,27] One limitation of this study was our measurme of vit C conceration was based on a single serum vit C which indicate only the short term (1 to 4 weak)vitamin status of an individual[28]. We note that non of the studies examined urinary frequency, a factor we thought to be inveresly associated with serum vit C, Additinoally serum concetration of other antioxidants were not measured in this study,Thus ,we not be sure that the observed associations were due entirely to (vit C ,albumin, uric acid),Also we did not measure insulin level in our patient and our explanation remains there for speculative.

Conclusion

Antioxidants like (vit C ,albumin,uric acid) may be beneficial as a possible markers for the identification of patients at risk from diseases such as diabetes mellitus or any inflammatory disease with oxidative damage.

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