

ENZYME AND GLYCOSYLATED HAEMOGLOBIN IN DIABETES

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ABSTRACT

The serum enzymes lactate dehydrogenase (LDH), aspartate transaminase (AST), alanine transaminase (ALT) and glycosylated haemoglobin were estimated in diabetic patients and diabetic patients with nephropathy. There was significant increase in the level of lactate dehydrogenase, aspartate transaminase, and glycosylated haemoglobin in the diabetic and diabetic nephropathic patients as compared to the control subjects.

INTRODUCTION

Hyperglycemia, caused by insufficient available insulin or inadequate insulin action in the body, is the most common character in all types of diabetes mellitus (Jamal, 1989). Hyperglycemia in diabetes mellitus increases the rate of glucose binding to haemoglobin. HbA is the most abundant. HbA₁ and HbA_{1c} have been found to be elevated in patients with chronic renal failure. This might be due to the fact that the end stage of renal disease can result in disturbances of carbohydrate metabolism even in non-diabetic patients. Increased HbA₁ levels in chronic renal failure may be caused by an increase in glycosylated haemoglobin, secondary to the associated glucose tolerance (Creutzfeldt *et al.*, 1970).

The liver occupies a strategic place in the body metabolism, there are certain liver conditions which are more often associated with diabetes (Conn *et al.*, 1969). Haider *et al.* (1977) found mild abnormality of AST and ALT in diabetic patients. Elevated levels of lactate dehydrogenase (LDH) are observed in a variety of conditions such as in patients with chronic renal diseases, especially those with nephron syndrome.

Approximately two-fifth of individuals with diabetes mellitus developed proteinuria. Nephropathy is common in individuals with non-insulin dependent diabetes mellitus, the patients with chronic renal disease especially those with nephrotic syndrome have increased values of lactate dehydrogenase (Watkins, 1989).

MATERIALS AND METHODS

Twenty control normal subjects (10 male and 10 female) with no family history of

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diabetes, thirty-five prediagnosed diabetic patients (15 male and 20 female) and 16 diabetic patients with nephropathy (8 male and 8 female) were selected for the present study. The diabetic patients had discontinued the antidiabetogenic drugs for 24 hours prior to blood sample collection. The serum samples from the control and the patients were utilized for the estimation of glucose (Dubowski, 1962). ALT, AST (kits supplied by Boehringer Mannheim GmbH Diagnostica), lactate dehydrogenase (kit supplied by Eiken Chemical Co. Ltd., Tokyo, Japan) and glycosylated haemoglobin (kit supplied by Biorex Company, USA).

RESULTS

Table-1 shows the age and weight of the control and patients. The serum glucose LDH, AST and HbA_{1c} levels are higher in diabetic patients and in diabetic patients with nephropathy as compared to normal control subjects (Table-2). The diabetic patients are further classified on the basis of the drugs they were taking. The raised LDH and AST levels were found in patients as compared to normal control subjects. The glycosylated haemoglobin level is higher in diabetic patients (Table-3).

DISCUSSION

Hyperglycemia is the cardinal sign of diabetes mellitus and is an index of severity of the disease. Higher the blood glucose level, greater is the metabolic derangement (Spiro, 1963). The diabetic patients had shown higher level of serum glucose (Table-2) as compared to the control subjects. The diabetic patients had higher level of glycosylated haemoglobin as compared to controls whereas Troillet and Gerster (1993) had found no difference in the level of glycosylated Hb. Polyurea, polydipsia joint pains, tiredness and hypertension were the main complaints of diabetic patients. The diabetic patients suffering from chronic renal disease were grouped separately. Nephropathy is common in individuals with non-insulin dependent diabetes mellitus. Patients with chronic renal disease, especially those with nephrotic syndrome have increased values of lactate dehydrogenase (Table-2) (Watkins, 1989). Vizir (1977) also found increased levels of LDH in diabetes mellitus. Ali *et al.* (1980) observed a correlation between blood glucose and lactate dehydrogenase. Shayusupora and Aripou (1974) also found higher values of LDH. The present study also showed a significant increased level of LDH in diabetic patients and diabetic patients with nephropathy as compared to control subjects. The AST level is also significantly higher in patients as compared to the normal control subjects (Table-2). But Bradley *et al.* (1955) reported normal activity of serum AST and ALT levels in patients whereas Haider *et al.* (1977) found a mild abnormality of AST and ALT in his patients.

Table-1
Age and weight of control and diabetic patients

All values are mean $\pm$ s.e.m. The number of cases are given in parenthesis

Group	Age	Weight
Control subjects	30.1 $\pm$ 1.9 (20)	63.9 $\pm$ 2.0 (20)
Diabetic patients	51.9 $\pm$ 2.0* (35)	68.1 $\pm$ 1.8 (35)
Diabetic patients with nephropathy	49.5 $\pm$ 3.5* (16)	67.3 $\pm$ 2.4 (16)

*Statistically significant $p < 0.005$ as compared to control subjects.

Table-2
Variation of serum glucose, lactate dehydrogenase (LDH), aspartate transaminase (AST), alanine transaminase (ALT) and glycosylated haemoglobin in control and patients

All values are mean $\pm$ s.e.m. The number of cases are given in parenthesis.

Group	Glucose (mg/dl)	LDH (U/L)	AST (U/L)	ALT (U/L)	HbA _{1c} (%)
Control subjects	72.4 $\pm$ 1.8 (20)	263.5 $\pm$ 12.3 (20)	13.6 $\pm$ 1.7 (20)	8.7 $\pm$ 0.6 (20)	6.8 $\pm$ 0.1 (20)
Diabetic subjects	267.7 $\pm$ 13.5* (35)	333.7 $\pm$ 15.7* (35)	22.8 $\pm$ 1.8* (35)	11.0 $\pm$ 1.5 (35)	9.8 $\pm$ 0.3* (35)
Diabetic patients with nephropathy	161.0 $\pm$ 10.7* (16)	424.4 $\pm$ 28.9* (16)	19.8 $\pm$ 1.7* (16)	9.5 $\pm$ 0.7 (16)	11.4 $\pm$ 0.9* (16)

*Statistically significant $p < 0.005$ as compared to control subjects.

Table-3

Variation of serum glucose, lactate dehydrogenase (LDH), aspartate transaminase (AST), alanine transaminase (ALT) and glycosylated haemoglobin in control and patients

All values are mean $\pm$ s.e.m. The number of cases are given in parenthesis.

Group	Glucose (mg/dl)	LDH (U/L)	AST (U/L)	ALT (U/L)	HbA _{1c} (%)
Control subjects	72.4 $\pm$ 1.8 (20)	263.5 $\pm$ 12.3 (20)	13.6 $\pm$ 1.7 (20)	8.7 $\pm$ 0.6 (20)	6.8 $\pm$ 0.1 (20)
Diabetic patients on oral hypoglycemic drugs	242.5 $\pm$ 13.7* (24)	308.1 $\pm$ 16.1* (24)	20.2 $\pm$ 2.8* (24)	11.7 $\pm$ 2.2 (24)	7.3 $\pm$ 0.1* (24)
Diabetic patients on insulin therapy	302.2 $\pm$ 29.7* (11)	405.0 $\pm$ 31.9* (11)	23.4 $\pm$ 3.8* (11)	8.8 $\pm$ 0.2 (11)	10.4 $\pm$ 0.4* (11)
Diabetic patients with nephropathy	161.0 $\pm$ 10.7* (16)	424.4 $\pm$ 28.9* (16)	19.8 $\pm$ 1.7* (16)	9.5 $\pm$ 0.7 (16)	11.4 $\pm$ 0.9* (16)

*Statistically significant $p < 0.005$ as compared to control subjects.

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