

SERUM SIALIC ACID LEVEL IN DIABETIC RETINOPATHY

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Background: The purpose of the study was to investigate the previously reported observations that patients with elevated levels of serum sialic acid are more prone to develop retinopathy. **Methods:** Fasting blood glucose and serum sialic acid levels were estimated in sixty diabetic patients with and without retinopathy between 30-60 years of age. Thirty normal persons of same age group were included as controls. Fundoscopy was done to confirm retinopathy. Serum sialic acid concentration was elevated in diabetic patients both with and without retinopathy but the increase was much significant in patients with diabetic retinopathy. **Results:** A significant correlation of serum sialic acid level with duration of diabetes and degree of retinal involvement was noticed in this study.

INTRODUCTION

Diabetes in elderly is a major health problem. The disease often comes to light incidentally while investigating such problem as heart disease, arterial insufficiency or failing vision¹.

Diabetic retinopathy is a frequent and early sign of vascular complications in diabetic patients². The cause of diabetic retinopathy is not known but animal experiments suggest that it is much more likely to occur when control of diabetes is poor³. In economically advanced societies diabetes associated damage to retina is the leading cause of visual disability arising in middle age and elderly people⁴.

Sialic acids (SA) are acid amino-sugars in nature⁶, and is the generic term given to a family of acetylated derivative of neuromeric acid⁷. N- acetylated neuromeric acid (NANA) is the principal neuromeric acid found in human tissues⁸, although there are more than 25 known naturally occurring derivatives of parent NANA⁹. Sialic acids are widely distributed in animal tissues and microorganisms as components of oligosaccharides, mucoproteins and glycoproteins. Smaller amounts of sialic acid also occur in free form in plasma¹⁰.

Serum sialic acid is directly related to cell turnover and is increased whenever there is increased cell turnover in the body as in pregnancy¹ and malignancy¹². Sialic acid being a major component of cell membrane is important in maintenance of cellular integrity¹¹.

The purpose of this study was to investigate the observations of Syrbe¹⁴ and Crook⁷, that patients with elevated levels of serum sialic acid are more prone to develop retinopathy. This may add a new parameter in investigation and treatment of diabetes mellitus and diabetic retinopathy.

MATERIALS AND METHODS

The study was carried out on sixty diabetic patients between 30 to 60 years of age who were further subdivided into patients having diabetic retinopathy and those without retinopathy. Fundoscopy was done

to confirm diabetic retinopathy. Thirty healthy persons were included as controls. Fasting blood sample was collected under aseptic condition; serum was separated and analyzed for fasting blood glucose level and serum sialic acid (SSA) levels.

RESULTS

Mean fasting blood glucose level in controls was 87 ± 9 mg/dl, in diabetic patients without retinopathy mean blood glucose level was 179 ± 24 mg/dl and in patients of diabetes mellitus with retinopathy mean blood glucose level was 194 ± 37 mg/dl as shown in the following table.

Table-1: Fasting blood glucose (FBG) and serum Sialic acid (SSA) level

	No	FBG mg/dl	SSA Level in g/l	SSA Level in mmol/l
Controls	30	89 ± 9	0.45 ± 0.11	1.44 ± 0.35
DM Without Retinopathy	30	179 ± 24	0.63 ± 0.9	2.02 ± 0.29
DM With Retinopathy	30	194 ± 37	0.81 ± 0.15	2.59 ± 0.47

Serum sialic acid level in controls was 0.45 ± 0.11 g/l or 1.44 ± 0.35 mmol/l in controls while in diabetic patients without retinopathy the serum level was 0.63 ± 0.9 g/l or 2.02 ± 0.29 mmol/l, corresponding values in diabetic patients with retinopathy were 0.81 ± 0.15 g/l or 2.59 ± 0.47 mmol/l showing statistically significant increase as compared to controls.

DISCUSSION

Increased glycosylation of various proteins in diabetic patients has been reported by many authors¹⁵. Measurement of glycosylation of plasma proteins can serve as a sensitive short term indicator of glucose homeostasis in diabetes mellitus*. Patients with both type 1 and Type II diabetes mellitus have raised serum levels of sialic acid¹⁶ and rising level of certain glycoproteins in the blood of diabetic patients may indicate the development of diabetic vascular

complications. Korte¹ \ observed that plasma membrane or regenerating retinal pigment epithelium contained SA-N-acetyl glucosamine residues. There is reliable evidence that sialic acid may be related to severity of diabetic complications such as retinopathy. Present study also showed that statistically significant increase in the level of SSA in patients with diabetic retinopathy than patients without retinopathy.

Diabetic retinopathy is characterized by a wide spectrum of different features. Thrombolytic vascular interactions are characterized by platelet spreading and capillary fragility which are significant for development of diabetic retinopathy¹⁴.

Table-2: Serum Sialic acid in patients with diabetes with less than and more than two years' duration without retinopathy

Duration	No.	SSA in g/l	SSA in mmol/l
< 2 Years	20	0.58 ± 0.02	1.87 ± 0.06
> 2 Years	20	0.68 ± 0.05	2.16 ± 0.16

Here in the duration dependent retinopathy $p < .01$, the results are highly significant meaning that serum sialic acid level increases with duration of diabetes mellitus. These results are in accordance with those of Rehman *et al.*¹

Table-3: Serum sialic acid in patients with diabetes with less than and more than five years' duration with retinopathy

Duration	No.	SSA in g/l	SSA in mmol/l
< 5 Years	20	0.76 ± 0.04	2.42 ± 0.13
< 5 Years	20	0.87 ± 0.06	2.78 ± 0.19

Again in this duration dependent retinopathy in diabetic patients increase in serum sialic acid level is highly significant

Table-4: Serum Sialic acid in diabetic patients with grade I and grade II retinopathy

	No.	SSA in g/l	SSA in mmol/l
Grade I without I maculopathy	15	0.72 ± 0.08	2.30 ± 0.25
Grade II with maculopathy	15	0.19 ± 0.13	2.91 ± 0.41

In diabetic patients with level of retinopathy there is significant increase in SSA with degree of involvement of retina and macula of the eye.

In this study it was found that serum sialic acid concentration was elevated in diabetic patients both with and without retinopathy. The relationship of SSA and diabetic retinopathy has been indicated by ^{7,14}. However this study also found a significant correlation of total SSA with duration of diabetes and degree of retinal involvement but there was no significant relationship of total serum sialic acid with age and sex.

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