

## PLASMA FIBRINOGEN LEVEL IN DIABETICS WITH COMPLICATIONS – A PROSPECTIVE STUDY

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### ABSTRACT

**Background:** The objective of this study was to determine the role of fibrinogen concentration in the development of complications in Pakistani diabetics.

**Material & Methods:** A total of 120 subjects ranging in age between 40 and 70 years from the staff members of Saidu Medical College, Swat and diabetics from the Medical OPD of Saidu Group of Teaching Hospitals were selected. Parameters like fibrinogen concentration, body weight, height, body mass index, and serum glucose concentration were measured and compared among all the groups according to the inclusion and exclusion criteria.

**Results:** Data indicated a highly significant increase in the parameters like body weight, fibrinogen concentration and plasma viscosity in diabetics with complications than diabetics with out complications and healthy control subjects.

**Conclusion:** Fibrinogen concentration and plasma viscosity is significantly elevated in diabetics with complications.

**Key words:** Diabetes, Fibrinogen, Plasma viscosity.

### INTRODUCTION

Plasma viscosity is directly proportional to the total plasma protein concentration. The major plasma proteins are fibrinogen, globulins and albumin. Of these, fibrinogen has the greatest positive effect on plasma viscosity than globulin and albumin.<sup>1</sup> Elevation of plasma viscosity due to corresponding increase in fibrinogen concentration significantly contributes to the increase in blood viscosity of diabetics.<sup>2</sup> Hyperviscosity has been shown to be an important component of microcirculatory disorder in diabetics.<sup>3</sup>

Prospective, epidemiological studies from Goteborg, Sweden,<sup>4</sup> London,<sup>5</sup> and Framingham,<sup>6</sup> have identified elevated fibrinogen as a risk factor for cardiovascular disease. In the Northwick Park Heart Study,<sup>5</sup> hemostatic factor, i.e. fibrinogen was a strong predictor for ischemic heart disease than cholesterol. Fibrinogen level was a strong and independent predictor of acute heart attacks.<sup>7</sup> Of the various hematological factors, elevated fibrinogen as a risk factor in diabetes plays the most important role in the development of complications.<sup>8</sup>

### MATERIAL & METHODS

This study was conducted in Department of Physiology, Saidu Medical College and Department of Medicine, Saidu Group of Teaching Hospitals, Saidu Sharif, Swat. A total of 120 subjects were selected for

the present study. Out of these 40 were healthy control subjects and were selected from the staff members of Saidu Group of Teaching Hospitals, 40 were diabetics with out complications, 40 diabetics with complications selected from the Medical OPD of Saidu Group of Hospitals, Saidu Sharif, Swat.

The body weight of the subjects was calculated by Marsdan Weighing Machine. Height of the subjects was calculated with Metal Scale and body mass index (BMI) of the subjects was calculated as weight in kilograms divided by height in meter square.

Seven ml of fasting blood simple (10-12 hours fast) was collected from each subject by venepuncture of antecubital vein under aseptic conditions in a routine morning visit to medical OPD of Saidu Group of Teaching Hospitals. Three ml of blood sample was carefully shifted in a clean test tube containing 0.5 ml of 3.8% trisodium citrate solution for estimation of serum glucose and fibrinogen concentration. While the remaining 4 ml of blood sample was carefully discharged in another 5 ml test tube containing Ethylene Diamine Tetra Acetic Acid (EDTA) for estimation of plasma viscosity. The viscosity was calibrated with distilled water at room temperature and measurements were made on plasma preserved at room temperature by a viscometer.<sup>9</sup> The flow ratio of plasma was compared with that of distilled water and was expressed as relative plasma viscosity.

- Criteria for diagnosis of diabetes mellitus were:
1. Elevated of plasma glucose (PG) >200 mg/dl and classic symptoms of diabetes, including polydipsia, polyuria, polyphagia and weight loss.
  2. Fasting plasma glucose (FPG) >140 mg/dl on two occasions.

## RESULTS

A total of 120 subjects were recruited in the study. Complete data of the subjects was recorded. Out of these 120 subjects, 40 were control subjects, 40 were diabetics with out complications and 40 diabetics with complications.

The statistical significance of difference between the mean values of the groups was evaluated by student's 't' test. The difference in the mean values of the two groups was regarded as statistically significant if the p value was less than 0.05 and highly significant if p value was less than 0.01.<sup>10</sup>

Table-1 shows comparison of anthropometric parameters (body weight, height and body mass in-

dex), plasma glucose concentration, plasma fibrinogen concentration and plasma viscosity of the controls and diabetics with out complications. No statistically significant differences were found in parameters like height, body mass index between the two groups, except the parameters like body weight, fibrinogen concentration and plasma viscosity which were significantly raised in diabetics with out complications ( $P < 0.05$ ) while the plasma glucose concentration was highly significantly raised in diabetics with out complications ( $P < 0.01$ ).

Table-2 compares the Anthropometric parameters (body weight, height and body mass index), serum glucose concentration, plasma fibrinogen concentration and plasma viscosity of the control subjects with diabetics with complications. No significant differences were found in parameters like height and body mass index between the two groups. Body weight was significantly raised in diabetics with complications than control subjects ( $P < 0.05$ ), while the parameters like plasma glucose concentration, plasma fibrinogen concentration and plasma viscos-

**Table 1: Comparison of anthropometric parameters (body weight, height and body mass index), plasma glucose level, plasma fibrinogen concentration and plasma viscosity between control subjects and diabetics with out complications.**

S. No	Parameters	Control Subjects	Diabetics without Complications
1	Body weight (kg)	58.90 ± 1.36	76.96 ± 1.78
2	Height (m)	01.66 ± 0.03	1.68 ± 0.02
3	BMI (kg/m <sup>2</sup> )	21.68 ± 0.26	22.40 ± 0.20
4	Plasma glucose (mg/dl)	102.40 ± 1.20	146.80 ± 2.40
5	Fibrinogen (mg/dl)	2.80 ± 0.04	3.20 ± 0.03
6	Plasma viscosity (cp)	1.68 ± 0.02	2.60 ± 0.02

Mean ± SEM values.

**Table 2: Comparison of Anthropometric parameters (body weight, height and BMI), plasma glucose level, plasma fibrinogen concentration and plasma viscosity between control subjects and diabetics with complications.**

S. No	Parameters	Control Subjects	Diabetics with Complications
1	Body weight (kg)	58.90 ± 1.36	74.80 ± 1.60
2	Height (m)	1.66 ± 0.03	1.70 ± 0.02
3	BMI (kg/m <sup>2</sup> )	21.68 ± 0.26	23.20 ± 0.03
4	Plasma glucose (mg/dl)	102.40 ± 1.20	140.00 ± 2.80
5	Fibrinogen (mg/dl)	2.80 ± 0.04	4.28 ± 0.10
6	Plasma viscosity (cp)	1.68 ± 0.02	4.68 ± 0.01

Mean ± SEM values.

**Table 3: Comparison of Anthropometric parameters (body weight, height and BMI), plasma glucose level, plasma fibrinogen concentration and plasma viscosity between diabetics with out complications and diabetics with complications.**

S. No	Parameters	Diabetics without Complications	Diabetics with Complications
1	Body weight (kg)	76.96 ± 1.78	74.80 ± 1.60
2	Height (m)	1.68 ± 0.02	1.70 ± 0.02
3	BMI (kg/m <sup>2</sup> )	22.40 ± 0.20	23.20 ± 0.03
4	Plasma glucose (mg/dl)	146.80 ± 2.40	140.00 ± 2.80
5	Fibrinogen (mg/dl)	3.20 ± 0.03	4.28 ± 0.10
6	Plasma viscosity (cp)	2.60 ± 0.02	4.68 ± 0.01

Mean ± SEM values.

ity were statistically highly significantly raised in diabetics with complications than control subjects. ( $P < 0.01$ )

Table-3 shows comparison of Anthropometric parameters (body weight, height and body mass index), serum glucose level, plasma fibrinogen level and plasma viscosity in diabetics with out complications with diabetics with complications. No statistically significant differences were observed in parameters like body weight, height, body mass index and plasma glucose level between the two groups, while statistically highly significant differences were observed in parameters like plasma fibrinogen concentration and plasma viscosity between the two groups higher in diabetics with complications than diabetics with out complications. ( $P < 0.01$ )

## DISCUSSION

In this study, we attempted to explore the role of fibrinogen concentration in the development of complications in Pakistani diabetics. The role of fibrinogen concentration in the development of complications in diabetics was also suggested by Wilhelmsen et al, that fibrinogen as a risk factor for stroke and myocardial infarction (1984). The same findings were also reported by the Framingham study (1987). The results, presented in this study indicate that fibrinogen concentration and plasma viscosity were statistically highly elevated in diabetics with complications. Similarly, Jensen et al. reported a progressive increase in fibrinogen level in diabetics with complications (1988).

## CONCLUSION

Fibrinogen concentration and plasma viscosity is significantly elevated in diabetics with complications. It seems to act as a risk factor in the development of complications in diabetes.

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