Fructosamine in Obese Normal Subjects and Type 2 Diabetes

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The effect of various grades of obesity on serum fructosamine concentrations was studied in Type 2 diabetic (n = 105) and non-diabetic (n = 128) subjects. In obese diabetic and non-diabetic subjects (body mass index ≥ 30 kg m⁻²), the concentration of fructosamine was markedly lower than that obtained for lean diabetic and non-diabetic subjects with similar glycemic control. Stepwise multiple-regression analysis showed that fructosamine was associated with glycemic control (as indicated by fasting plasma glucose and glycated haemoglobin), fasting triglycerides, and body mass index in both diabetic and non-diabetic subjects. In vitro studies showed marked decreases in both the extent of [¹⁴C]-glucose incorporation into plasma proteins and fructosamine production by incubated sera of obese patients whether diabetic or non-diabetic, with obese subjects with body mass index > 40 kg m⁻² exhibiting the greatest decrease. In conclusion, serum fructosamine concentrations are shown to decrease in obese diabetic and non-diabetic subjects with body mass index ≥ 30 kg m⁻² giving rise to the underestimation of glycemic control as indicated by fructosamine measurement. A change in the glycation reaction itself may be partly responsible for such decrease.

KEY WORDS Fructosamine Diabetes Obesity Glycemic control Glycation

Introduction

Plasma proteins such as albumin undergo post-translational non-enzymatic glycation in vivo, the percentage of which being a function of the glycemic control and the rate of the individual protein's turnover. Moreover, increased rates of non-enzymatic glycation of plasma proteins in response to uncontrolled diabetes mellitus, may contribute to the chronic complications of the disease. Glycated haemoglobin (HbA₁c) and fructosamine measurements are considered to be useful retrospective markers of long-term (6–8 weeks) and intermediate-term (2–3 weeks) glycemic control in diabetic patients, respectively. Recently, glycated fibrinogen was suggested to be an index of short-term (2–3 days) diabetic control. Several studies have described changes in fructosamine concentrations in pathological states other than diabetes mellitus including hypothyroidism, hyperthyroidism, chronic renal disease, and severe hypoalbuminæmia. Moreover, plasma fructosamine concentration was found to decrease in pregnancy due to haemodilution. Therefore, the precise clinical value of fructosamine concentrations in evaluating retrospectively the glycemic control in diabetic patients is still under investigation.

Recently, Brousse et al. described decreases in fructosamine concentrations in response to obesity with or without diabetes mellitus, and similar findings were obtained in non-diabetic obese subjects by Skrha and Svancra. However, Woo et al. concluded that the effect of obesity on fructosamine is small; body mass index (BMI) (< 32 kg m⁻²) in non-diabetic women and diabetic men showed no effect, whereas in non-diabetic men and diabetic women 3% and 14% effects were observed, respectively. In an extension of these studies, we have investigated the value of fructosamine as a retrospective index of blood glucose control over the preceding 2–3 weeks in Type 2 diabetic patients with various degrees of obesity and compared with non-diabetic subjects with similar degrees of obesity. The results are discussed in relation to the value of fructosamine as an index of intermediate glycemic control in diabetes mellitus.

Patients and Methods

One hundred and five patients with Type 2 diabetes attending diabetic clinics of King Abdulaziz University Hospital, Jeddah and Alawia Tourism Hospital, Makkah, Saudi Arabia, agreed to participate in this study. Diabetic patients were treated with diet only (n = 73), diet and insulin (n = 5) or hypoglycaemic agents (n = 27), respectively. Dependent on BMI, diabetic patients were divided into four groups:

- lean group with BMI < 25 kg m⁻²;
- obese group 1 with BMI > 25 to ≤ 30 kg m⁻²;
- obese group 2 with BMI > 30 to < 40 kg m⁻²;
- obese group 3 with BMI ≥ 40 kg m⁻².

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