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Diabetologia

Letters to the Editor

Serum fructosamine assay: influence of serum protein concentration

Dear Sir,

Serum fructosamine is a clinical indicator of previous glycaemic control [1]. Recently, it has been found to vary with serum protein levels [2-5]. We executed a study in order to derive a formula to correct serum fructosamine measurements for serum protein in a manner similar to that described by Howey et al. [3].

We used 330 subjects, comprising 175 non-diabetic subjects with fasting plasma glucose levels ≦ 5.6 mmol/l and 155 diabetic patients with fasting plasma glucose levels ≧ 6.7 mmol/l and serum fructosamine levels < 4 mmol/l. We measured fructosamine with a prepared test (Hoffman La Roche, Basel, Switzerland) by the method of Johnson et al. [1]. Serum glucose was measured by the glucose oxidase method, and serum total protein and serum albumin by the Biuret method and the brom-cresol-purple method (TBS-80S, Toshiba Co., Tokyo, Japan) respectively. Statistical analysis was by Student's t-test.

In both groups, serum fructosamine correlated significantly and positively with serum total protein and with serum albumin ($Y = 0.291X + 0.880$, $n = 330$, $r = 0.52$, $p < 0.001$; $Y = 0.308X + 1.676$, $n = 330$, $r = 0.49$, $p < 0.001$, respectively) (Fig. 1). This observation gave rise to a correction formula designed to give a true serum fructosamine level when the serum total protein was 70 g/l or when the serum albumin was 40 g/l. Corrected fructosamine = measured fructosamine + 'A' (70 or 40 - serum total protein or serum albumin), where 'A' is 0.29 for serum total protein and 0.31 for serum albumin, for the combined population of diabetic patients and non-diabetic subjects.

Fructosamine measurements will vary with the levels of serum protein, the proportion of serum protein, and the life span of serum protein. The level is the most significant clinical factor. One possible correction would involve dividing fructosamine levels by total protein. However, the problem with this quotient is that when serum total protein or albumin is low, serum fructosamine is likely to be high, and vice versa. We considered the suggestion by Howey et al. [3] that correction might employ fixed levels of serum total protein and serum albumin.

All our diabetic patients had less than 4 mmol/l serum fructosamine. Since 'A', the coefficient of the regression line, did not significantly differ between diabetic patients and non-diabetic subjects, we ignored the group values (0.28 and 0.29 for serum total protein, diabetic patients and non-diabetic subjects respectively, and 0.30 and 0.35 for serum albumin) and calculated values for 'A' using the population as a whole. This yielded A = 0.29 for serum total protein and 0.31 for serum albumin. Since patients with serum fructosamine levels over 4 mmol/l immediately receive emergency medical treatment to lower their blood glucose levels anyway, we do not think our formula suffers unduly for applying only to diabetic patients with serum fructosamine 4 mmol/l. 'A' may be very high in patients with high serum fructosamine levels, but when serum fructosamine levels are lower than 4 mmol/l, our formula would seem clinically appropriate for diabetic patients and non-diabetic subjects alike.

Yours sincerely,
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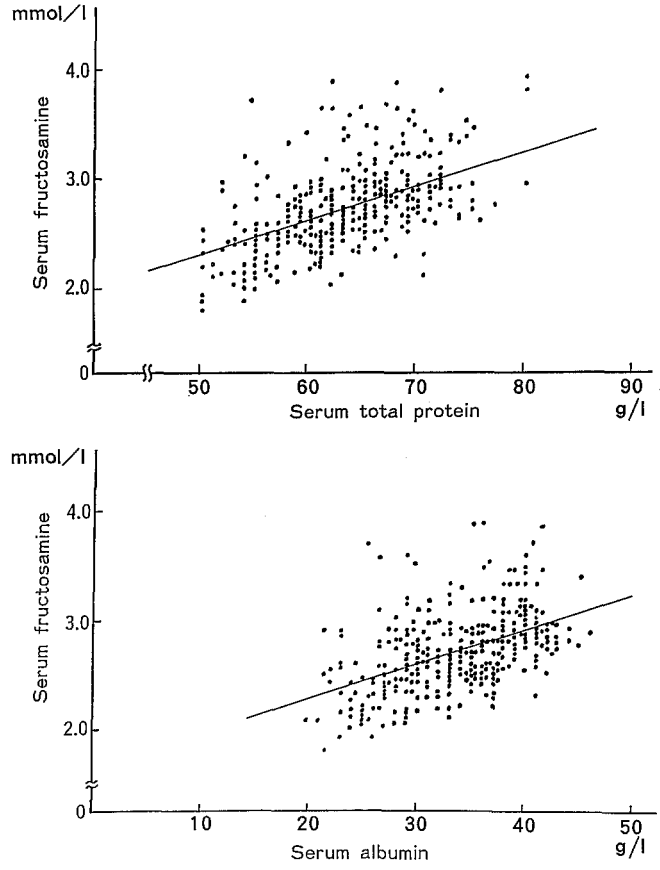

Fig. 1. Correlation between serum total protein and serum albumin concentrations and serum fructosamine concentration in non-diabetic and diabetic subjects. Upper panel: correlation between serum total protein and serum fructosamine concentrations. Bottom panel: correlation between serum albumin and serum fructosamine concentrations

References

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