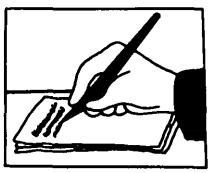
Short Reports



Assessment of Past Glycemic Control

Measure Fructosamine, Hemoglobin A_1, or Both?

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Measurement of serum fructosamine is a simple, fast, and inexpensive method for the quantitation of glycosylated serum proteins (1,2). Fructosamine level correlated with hemoglobin A_1 (HbA_1) in diabetic patients in several studies (1,3,4). However, whereas fructosamine and glycosylated serum protein levels reflect the integrated glycemia over ~2 wk (1,5), HbA_1 reflects integrated glycemia over 4–6 wk (5).

Because it has been suggested that fructosamine can be used as a substitute for HbA_1 assay in the monitoring of diabetic patients, we investigated the relationship between the two in a group of 77 randomly selected diabetic patients [with insulin-dependent (IDDM) or non-insulin-dependent (NIDDM) diabetes mellitus] tested without prior warning at a diabetic outpatient clinic. Sixteen nondiabetic control subjects were also tested.

Serum fructosamine was measured by the nitro blue tetrazolium reduction method at pH 10.35 with a reagent kit (kindly provided by Roche Diagnostics, Welwyn Garden City, UK) with secondary protein-based standards originally standardized against 1-deoxy-1-morpholino-D-fructose (DMF) (6). The assay was performed on an RA-1000 random access analyzer (Technicon, Tarrytown, NY). HbA_1 was measured by affinity chromatography with a GlycoGel B minicolumn system (Glycotest, Pierce, UK; 7).

Fructosamine level was 2.11 ± 0.06 mM (mean ± SD) in nondiabetic subjects and 3.44 ± 0.65 mM in

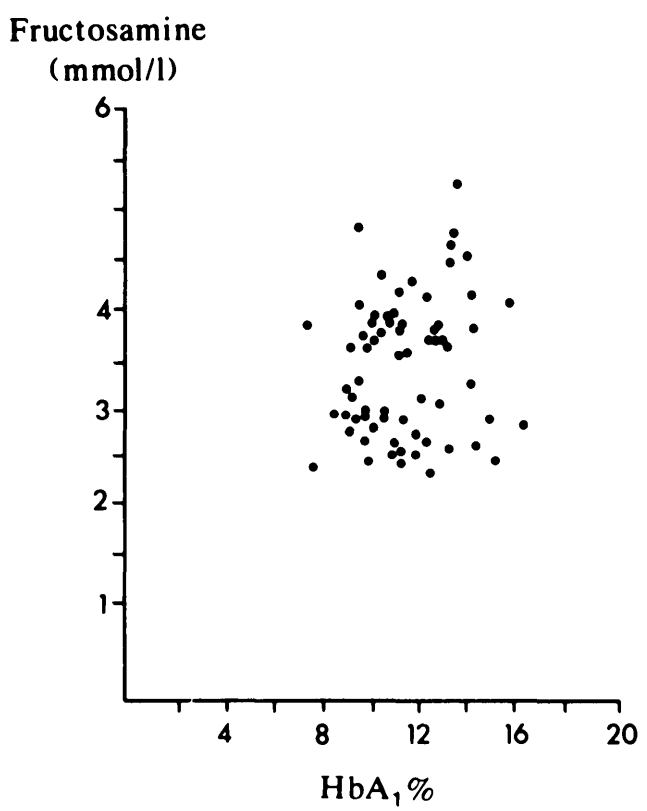

FIG. 1. Relationship between serum fructosamine and HbA_1 in diabetic outpatients (n = 77, r = .17, NS).

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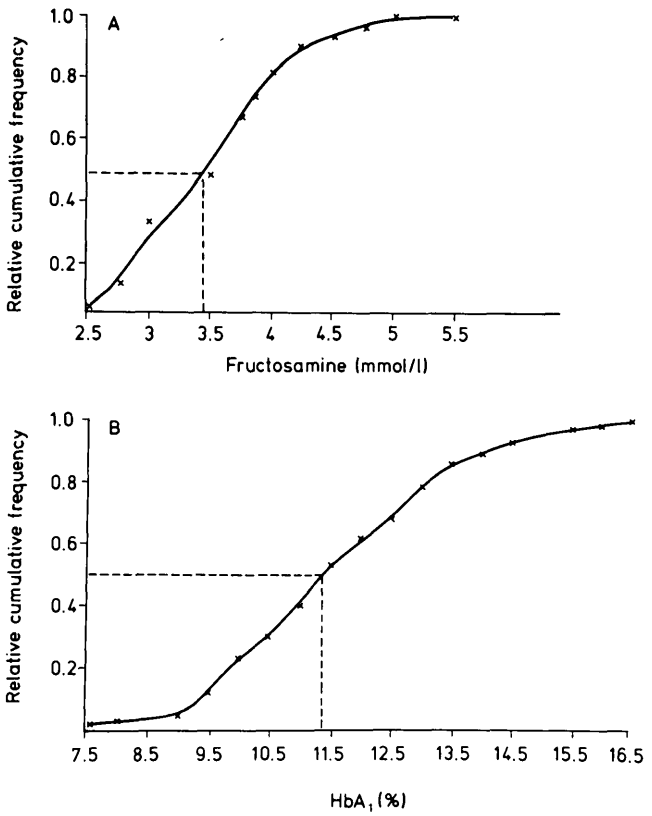

FIG. 2. Cumulative frequency distribution of fructosamine (*A*) and HbA_1 (*B*) values in diabetic patients.

diabetic subjects ($P < .001$). HbA_1 levels in nondiabetic and diabetic subjects were 7.1 ± 0.8 and 11.6 ± 1.8%, respectively ($P < .001$).

Random blood glucose in diabetic subjects was 277 ± 106 mg/dl (15.4 ± 5.9 mM). Fasting plasma glucose in nondiabetic subjects was 83 ± 9 mg/dl (4.6 ± 0.5 mM). There was no correlation between fructosamine and HbA_1 levels in the diabetic group as a whole ($r = .17$, NS; Fig. 1) or in IDDM and NIDDM patients considered separately ($r = .2$ and $r = .03$, respectively).

To assess the degree of concordancy between the increase of fructosamine and HbA_1 in diabetic patients, the 50th-percentile values were used as cut-off points. Cumulative frequency distribution of fructosamine and HbA_1 values is shown in Fig. 2. The 50th-percentile values for fructosamine and HbA_1 were 3.4 mM and 11.4%, respectively. Twenty-three patients (29.9%) had both HbA_1 and fructosamine values >50th percentile, and 21 (27.3%) had both values <50th percentile. Of all patients, 42.9% had discordant results: 13 (16.9%) had a fructosamine level below and HbA_1 above the 50th percentile, whereas 20 (26%) presented with an inverse pattern, i.e., fructosamine above and HbA_1 below the 50th percentile.

Good correlations between tested variables can occur in a large study despite poor agreement of individual results (8). Some of the previous data indicate that this might be the case when short-term indices of glycemic control are compared with HbA_1. For example, in the study by Hindle et al. (4), despite high correlation ($r = .78$) between fructosamine and HbA_1, the spread of individual fructosamine values at any given level of HbA_1 was considerable.

Our results suggest that despite frequently reported good correlation between fructosamine and HbA_1, the relationship between the two variables may be much less close in individual patients. Fructosamine and HbA_1 levels reflect different periods of time-integrated glycemia and, if used separately, can give different impressions of past diabetic control. Further studies are needed to establish relative clinical benefit of using HbA_1, fructosamine, or both tests in parallel in the monitoring of diabetic patients.

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