to the IgG and λ–light chain by immunoelectrophoresis. These findings favor the view that the M proteins could be antibodies specific for endogenous insulin. Indeed, some M proteins have shown antibody activity, most frequently directed toward autoantigen.

The estimated size of soluble insulin-antibody complex approximated 170,000 M_r. This value may reflect that one molecule of IgG (M_r 160,000) binds two molecules of insulin (M_r 5700); it has been proposed that one IgG antibody has only two binding sites for insulin at saturation (4). In this respect, therefore, the valency of these antibodies appears not to differ from that resulting from immunization.

The maximum binding capacity of these antibodies is unusually high, $10–10^3$ times higher than in cases previously reported (1). In contrast, the binding affinity of these antibodies is quite low. Previously reported values for insulin-antibody association constants (K_a) range from 10^{10} to 10^8 and 10^8 to 10^7 M^{-1} for the high- and low-affinity sites, respectively, so the K_a in this case is almost comparable to values reported for low-affinity sites. In this context, because the low-affinity antibodies are only constituents, the dissociation of free hormone may easily occur once the binding equilibrium is perturbed. All these characteristics of the antibodies must have contributed to the frequent bouts of severe hypoglycemia in this patient.

Recently, Sklenar et al. (5) reported a case of IAIS associated with monoclonal insulin antibodies. The affinity of those antibodies (K_a 0.54×10^7 M^{-1}) was substantially low when compared with that of our patient, whereas immunoglobulin class of the IgG and λ–light chain was the same as in our case. However, the antibodies in their case were specific for human insulin but not for porcine and bovine insulin, thereby recognizing an epitope involving amino acid B-30 (Thr). In contrast, the insulin antibodies in our case did not exhibit such species specificity.

Although IAIS has been regarded as a form of factitious hypoglycemia, the monoclonal insulin antibodies demonstrated in these cases provide additional evidence against that possibility.

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Nutrition Education and Social Learning Interventions for Type II Diabetes

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Two diabetes education programs were compared to a control condition. Seventy-eight type II (non-insulin-dependent) diabetic outpatients were randomly assigned to nutrition education, nutrition education plus social learning intervention, or wait-list control conditions. Both interventions involved five weekly meetings that focused on reducing calorie intake, increasing dietary fiber, and decreasing fat consumption. The social learning condition also included individualized goal setting and feedback and training in problem-solving and relapse prevention. Within-group analyses and between-group comparisons generally revealed greater improvement in targeted goals (e.g., calorie intake, fat reduction) among intervention conditions than the control condition. There were few differences in more distal measures of outcome such as weight or glycosylated hemoglobin. The social learning component did not improve outcome more than the nutrition education program. Possible reasons for the observed findings and the advantages and limitations of focused time-limited diabetes education efforts are discussed. *Diabetes Care* 12:150–52, 1989

Several lines of research suggest that diet is the regimen area with which individuals with type II (non-insulin-dependent) diabetes have the greatest difficulty and the area in which improvements could potentially lead to the greatest health benefits (1,2). However, interventions for improving diabetes control via dietary interventions have generally proven disappointing (3). Based on relationships between the social learning variables of self-efficacy and problem solving in our earlier work, we designed a brief behavioral intervention for improving nutritional habits among diabetic patients (4,5). Specific goals were calorie reduction, reduction in saturated fat consumption, and increases in dietary fiber intake.

The purposes of this comparative study were to determine *1*) whether a time-limited nutrition education program would improve dietary behaviors (not necessarily weight loss) more than a control condition and *2*) whether adding the social learning components of problem solving and self-efficacy would enhance the outcomes of the basic program.

MATERIALS AND METHODS

The subjects were 78 outpatients with less than average glycemic control [i.e., glycosylated hemoglobin (GHb) >9% or physician's judgment of poor control if GHb not available] who met the clinical criteria recommended by Welborn et al. (6) for type II diabetes. Subjects ranged from 42 to 75 yr of age; 73% were women, and the average percent of desirable weight was 153%. Forty-two percent were prescribed oral diabetes medication, and 39% took insulin. Baseline fasting blood glucose levels averaged 175 mg/dl, and initial GHb averaged 9.7% (in our lab the mean ± SD for nondiabetic subjects was 7.1 ± 0.9%).

Treatment conditions. Subjects were stratified by sex, mode of therapy (on insulin or not), and physician and then randomly assigned to one of 3 conditions: nutrition education (NE), nutrition education plus social learning (NE + SL), or wait-list control. The first two groups met weekly for 5 wk in small group meetings lasting 1.5–2 h.

The NE program targeted three specific areas *1*) reduction in calorie intake of 500–800 kcal from baseline, *2*) reduction in fat intake to 30% of calories, and *3*) increases of 10–20 g/day of dietary fiber. Weight loss was specifically deemphasized and presented as a possible bonus that might occur for some participants.

The NE + SL group received the NE program but had additional components, including goal setting based on individual barriers to adherence and modeling of strategies used successfully by other individuals with type II diabetes (2). In addition, this group was taught a problem-solving method called STOP (**S**pecify the problem; **T**hink of options; **O**pt for the best solution; **P**ut the solution into practice).

Subjects used a food record to record each food item eaten for 3 consecutive days, including 2 weekdays and 1 weekend day. Reacted blood glucose reagent strips were immediately placed in airtight Chemstrip bG containers and read by the staff on Accu-Chek reflectance meters within 1 wk of collection. GHb was measured using a modification of the Fluckiger and Winterhalter (7) thiobarbituric acid method.

RESULTS

All 56 subjects assigned to the two diabetes education conditions completed treatment and posttest. In contrast, 4 of the 22 subjects assigned to the control condition failed to complete posttest [χ^2 (2) = 10.08; $P < .01$]. Of the subjects who completed posttest, 84% participated in the 2-mo follow-up, with no differences between conditions. Table 1 presents dietary intake results. As shown in Table 1, subjects in the NE + SL condition significantly reduced their calorie intake and percent of calories from fat and maintained these reductions through the 2-mo follow-up. In addition, the NE + SL condition produced a statistically significant

TABLE 1
Pretest, posttest, and 2-mo follow-up results in dietary variables for subjects with data at all three assessments

Dietary Variables	*n*	Pretest	Posttest	Follow-up
Mean calories				
Nutrition education	20	1657.9 ± 508.8	1657.7 ± 458.7	1519.8 ± 450.9†
Nutrition education + social learning	23	1874.8 ± 582.4	1651.2 ± 527.8*	1554.1 ± 504.8‡
Wait list	16	1835.2 ± 643.2	1788.9 ± 547.0	1818.1 ± 471.5
Mean percent calories from fat				
Nutrition education	20	36.2 ± 8.0	35.6 ± 8.2	38.1 ± 9.4
Nutrition education + social learning	23	40.6 ± 7.0	35.7 ± 9.5*	36.8 ± 6.7*
Wait list	16	38.5 ± 9.7	35.3 ± 10.4	39.2 ± 9.0
Mean grams of fiber				
Nutrition education	20	19.8 ± 8.5	24.7 ± 13.1	19.0 ± 8.6
Nutrition education + social learning	23	23.3 ± 10.8	24.3 ± 10.3	21.9 ± 8.0
Wait list	16	26.2 ± 19.4	21.3 ± 15.5	24.2 ± 22.8

Values are means ± SD. *$P < .01$; †$P < .05$; ‡$P < .001$, significant within-group change from pretest.

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decrease in weight [$t(16) = 2.19$; $P < .05$] at the 2-mo follow-up (weights were not collected at posttest).

Subjects in the NE condition significantly improved only in calorie consumption from pretest to follow-up [$t(19) = 2.15$; $P < .05$], and wait-list subjects did not show significant improvement on any measure.

Analyses of covariance (covarying pretest scores) comparing the two treatment conditions to the wait-list condition revealed that the combined intervention conditions were superior to the control condition in two of the dietary measures: calorie reduction from pretest to follow-up [$F(1,57) = 5.85$; $P < .05$], and change in fiber consumption from pre- to posttest [$F(1,63) = 3.93$; $P < .05$]. There were no significant between-group differences in glycemic control or weight, although the intervention conditions produced marginally greater reductions in fasting blood glucose than the control condition [$F(1,57) = 3.12$; $P < .08$]. Comparisons of the NE condition to the NE + SL condition failed to reveal significant differences in either dietary or glycemic control measures.

DISCUSSION

The purposes of this study were to determine if our interventions would improve dietary behaviors, and if adding SL components to the NE program would further improve self-care. The pattern of means and within-group analyses indicated that the two intervention groups improved more than the control condition, despite differential attrition that probably biased the results against these groups. This was particularly true in terms of calorie restriction and fat reduction. Between-group analyses revealed greater improvement for intervention than control conditions in calorie intake and fiber consumption. If such brief interventions can produce change in targeted behaviors associated with risk reduction, this can be a valuable outcome even if not producing significant improvement in weight or GHb. Longer-term follow-ups, however, are needed to more fully evaluate intervention effects.

Data relevant to the second question are less encouraging. Although within-group analyses were suggestive of greater improvement for the NE + SL condition than the NE condition, between-group analyses failed to produce significant differences. It may be that a low-intensity behavioral intervention is not sufficient to produce improvements in such longstanding and resistent variables as dietary patterns and weight (8).

Type II diabetes is a heterogeneous disease, and our intervention may have worked with some types of patients but not others. However, our patient assignment strategy and preliminary analyses suggest that demographics, severity of diabetes, and history of diabetes did not confound or interact with treatment outcome.

We believe that efforts to develop and evaluate brief interventions to assist patients in achieving specific goals, such as improving various self-care behaviors (compliance) are worthwhile. Such programs may reach and appeal to sizable numbers of patients but are less likely to produce improvement in other nontargeted areas such as body weight or GHb. Perhaps these interventions could serve as the first stage in a comprehensive stepped-care approach to diabetes education, with patients who have not reached program goals referred to more intensive and costly interventions, as has been suggested for other areas of behavior change (9).

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