Development of the Diabetes Knowledge (DKN) Scales: Forms DKNA, DKNB, and DKNC

STEWART M. DUNN, B.A., JANET M. BRYSON, B.Sc., PENELOPE L. HOSKINS, B.Sc., JAN B. ALFORD, S.R.N., DAVID J. HANDELSMAN, M.B., AND JOHN R. TURTLE, M.D.

The Diabetes Knowledge Assessment (DKN) scales were developed to meet a specific need for rapid and reliable knowledge assessment in diabetic patients. Item format and item selection from an initial pool of 89 items were determined by pilot-testing over 300 diabetic subjects. Reliability analysis of the resulting 40 multiple-choice items, with a further sample of 56 subjects, gave a Cronbach's alpha coefficient of 0.92. Parallel forms DKNA, DKNB, and DKNC, each of 15 items selected from the parent set, had alpha coefficients above 0.82 and correlated 0.90 with each other. A full clinical trial, using DKNA, DKNB, and DKNC in randomized order of presentation, was conducted with 219 subjects attending a 2-day diabetes education program. Overall DKN scores improved from 7.6 (51%) to 11.3 (75%). Analysis of variance confirmed that DKNA, DKNB, and DKNC were equivalent forms at pretest. Mean posttest scores on DKNB were lower than the other scales ($P < 0.001$), but variances were equivalent for all three. A specific local change in the education program format was found to account for this discrepancy in the DKNB posttest mean. In situations where comprehensive assessment of diabetes knowledge would be time-consuming and unnecessary, these results indicate that rapid and reliable assessment is possible with a scale of only 15 validated items. The development of parallel forms of the scale extends the range of retesting possibilities for diagnosis and research. DIABETES CARE 7: 36–41, JANUARY–FEBRUARY 1984.

Diabetes management continues to evolve in the postinsulin era. Recent awareness of the cost-benefits of sustained intervention over decades has emphasized the essential role of patient self-management of diabetes. A committee of the American Public Health Association reported that "an educational plan should be developed and should be reassessed periodically since the patient's educational needs change depending on such factors as his medical condition, his knowledge, attitudes and abilities."[1] Assessment of the individual patient's knowledge of diabetes and its management is critical before an effective educational program can be implemented. But knowledge is only one of a number of predisposing factors that have been linked with program effectiveness, and it has become necessary to develop an efficient instrument for the rapid and reliable assessment of diabetes knowledge. Parallel forms of such an instrument would serve a most useful function since, in combination with measures of other predisposing factors, they would enable one to tailor a program to the needs of the individual and to assess program efficacy over time.

Two recent studies have emphasized the need for quality control in this important area of adjustment to diabetes. Davis et al.[1] described the first step in developing a standardized scale to assess the educational needs of diabetic patients, beginning with a massive survey of health professionals to achieve consensus on suitable items. Diabetes knowledge was identified as one of three major factors. Windsor et al.[2] went a step further in reporting results of a pilot trial and clinical study of cognitive and performance indexes developed specifically for diabetes educational assessment. Both studies stressed that effective assessment, particularly of cognitive aspects of diabetes management, should be comprehensive assessment. In the Davis survey, respondents concurred on 36 items as essential to adequate evaluation of patient knowledge. Windsor et al. consulted a panel of experts to arrive at 25 items, which were later expanded to 35 for the clinical trial.

The notion of comprehensive and standardized knowledge assessment has face validity, and it has gained wide acceptance in practice. But just how important a feature of diabetes education is knowledge? Is its importance in diagnosis and research justified by its often time-consuming assessment?

Research reports on diabetes knowledge present a confusing and often contradictory picture. Variables which one might expect to show simple linear correlation with knowledge do not. Age, for example, is inconsistently related to knowledge in juvenile diabetic patients, and only appears to show a reliable negative correlation in adulthood.[3-8] Results for duration of diabetes are contradictory,[7,8] as are correlations with knowledge reported for socioeconomic status variables.[7,9,10] The picture for diabetes control and its relation to knowledge is similarly confused.[5,6,8-12] Much of this conflicting evidence on the correlates of diabetes knowledge is a consequence of the poor standardization of the instruments used in its assessment. Items have been included on the basis that "most diabetic patients should be able to answer them,"[7] or other unspecified "predetermined criteria."[13] Other scales have employed arbitrary weighting for some items.[6,14] Many of these items and weightings may be perfectly valid; however, no validation has been reported.

Lack of validation of test items is a statistical problem that is readily remedied, as Davis et al.[1] and Windsor et al.[2] have demonstrated. A more deeply entrenched problem is the bourgeoning number of test items in use. The 15 original items of Etzwiler[3] were modestly defended on the grounds that the questionnaire was not expected to differentiate the person with extensive knowledge from persons only moderately well informed. More recent scales from Etzwiler and his associates have been expanded to 34 items.[9] Questionnaires in current use contain anywhere from 30 to 40 items[1,2,7,15] up to a mammoth 160 items requiring 60 min to complete.[16] Difficulty in motivating patients to complete lengthy written questionnaires is ubiquitous[7] and only serves to compound the problems of interpreting scores that are subject to the combined effects of boredom, fatigue, and intimidation. The knowledge test becomes less a test of knowledge than an assessment of extraneous factors such as intelligence, educational level, test sophistication, and simple stamina.

Knowledge is but one of many important variables involved in diabetes education, and time overspent on assessing knowledge is lost to the assessment of other factors. Lane and Evans[17] have argued that the most disturbing fact about using knowledge as the only criterion of educational program impact is the lack of demonstrated correlation between knowledge and control of the disease. Various researchers in the field agree and further contend that increasing evidence exists to link a number of predisposing factors with program effectiveness.[5,18-20] Attitudes, beliefs, and anxieties influence and are influenced by diabetes education; they also modify diabetes knowledge and behavior.[6,21] Unless these factors are taken into account, we may overlook situations where improvements in knowledge actually render a disservice to the patient, activating defense mechanisms that inhibit adaptation and promote the development of maladaptive symptoms.[3] Green et al. suggested that knowledge should be seen as an intervening variable which creates the potential for improved compliance and adaptation, and thereby control, but is not a significant outcome by itself.[19]

Knowledge is thus one of the variables to be assessed in diagnosing educational needs and in evaluating educational programs. There is a need for shorter, more efficient tests of diabetes knowledge that contain the essential ingredients of high validity and reliability. Davis et al., for example, concluded that there was no need to have all 94 items in the final version of the Diabetes Educational Profile, as all items were highly correlated.[1] In circumstances where test items are to be reduced in number, a criterion of internal consistency is commonly used. Items that have the highest point biserial correlation with total test scores are retained. A primary aim of the research reported in this paper was to develop a test of diabetes knowledge using a subset of items of high internal consistency selected from the full domain of diabetes knowledge.

As a consequence of developing shorter instruments, it was anticipated that application of the test to evaluation of a diabetes education program would increase the incidence of uncontrolled fluctuations in test scores, which are inherent in test-retest designs. In such cases, reliability of the test tends to decrease systematically as a function of increasing time interval between administrations. Conversely, when the time interval is short, memory effects may produce spuriously high correlation between measurements since subjects will recall previous responses and reproduce them. Parallel forms of the same test present a solution to this problem. The criteria for parallel tests are discussed by Gulliksen.[22] Briefly, they are that the different forms should be similar in test content and item type with near-equal mean and standard deviation. The intercorrelations between forms should also be similar (i.e., $r_{AB} = r_{AC} = r_{BC}$). Having developed an efficient scale for rapid assessment of diabetes knowledge, our second objective was to develop the scale further by providing parallel forms for longitudinal program evaluation.

SELECTION OF ITEMS: SAMPLE 1

A variety of item formats are reported in the literature on diabetes knowledge: multiple-choice items are most popular,[3-10,14,23] followed by true/false[2,10] and open-ended questions.[13,16] Our initial pool of 89 items represented all item formats and was derived from a literature search beginning with Etzwiler and his associates.[3-5,9] Items were also contributed by physicians, nurses, dietitians, and diabetes educators attached to the Diabetes Clinic at the Royal Prince Alfred Hospital (R.P.A.H.). The 89 items were pilot-tested in six different presentation formats with small samples and reduced by deletion of duplicated and redundant items to a total of 45. One-third of these items were multiple-choice, one-third were true/false, and the remainder were open-ended questions requiring interpretation of the subjects' answers by a trained interviewer.

These 45 items were given to 300 patients attending the diabetes clinic during 1976–77. One interviewer conducted all testing. Computer records maintained on the clinic population of 4000–5000 diabetic patients enabled us to confirm the representative nature of this sample. The R.P.A.H. clinic serves a predominantly working-class adult population; 69% of the sample occupied levels V, VI, and VII, being the three lowest levels of the Congalton Occupational Status Scales.[24] Mean age of the sample was 44 yr, and 60% were women. Mean duration of diabetes was 10 yr and 61% had insulin-dependent diabetes (IDDM). HbA_{1c} values averaged 10.0% for IDDM patients and 9.7% for non-insulin-dependent (NIDDM) patients. Most of the subjects (72%) had read literature on diabetes, and 46% had attended diabetes education programs; 21% had received no formal diabetes education. The sample was equal to the clinic population in all respects other than ethnic origin, which was underrepresented by 5% owing to the unavailability of interpreter facilities to interview non-English-speaking groups.

The mean score on the 45 mixed-format items for 300 patients was 34.1 ± 6.8. This average score of 76% items correct is consistent with results reported elsewhere. Etzwiler and his associates, using essentially the same items, reported averages of 63–73%[3–5,9] (extrapolated from tables in text). Mean scores of 56–71% were also reported or may be extrapolated from other studies.[2,6,8,10,13,14,16,23]

A high score on these 45 items was correlated ($P < 0.001$) with more exposure to diabetes literature ($r = 0.52$), regular urinalysis (0.41), and frequent physical exercise (0.48). The relation between knowledge and exercise has been noted by Ludvigsson.[6] High scores were also related ($P < 0.01$) to age (−0.31), increasing treatment regimen (0.34), attendance at diabetes education programs (0.21), and higher occupational status (−0.33). These correlations confirm some of the findings of studies discussed previously[3–12] and indicate the potential for consistency in the data based on effectively standardized measurement instruments.

The preceding analysis confirmed the initial face validity of the 45 items. The final choice of item format was determined by examination of the response patterns for the three formats. The open-ended questions were found to introduce a bias against a majority of our subjects who were limited in their ability to express verbally such abstract concepts as "renal threshold" in response to the question: "Why is sugar found in the urine of diabetics?" Subjects were frequently able to identify the correct answer among a list of multiple-choice alternatives, although they were unable to provide an answer to the same question in open-ended format. The true/false format, by virtue of its 50% probability of a correct response by guessing alone, produced ambiguous item difficulties when compared with the multiple-choice format. Other studies employing the true/false format reported similar variation in item difficulties.[2,10] For example, item difficulties in the pilot study sample of Windsor et al.[2] differed from those in their clinical test sample by more than 0.20 for six items and by more than 0.30 for three of these. In our sample, the multiple-choice items alone remained stable in terms of item difficulty: by comparison with Collier and Etzwiler's data,[9] the mean score on 13 identical items was 72% in our sample and 77% for their study. The correlation between individual item means was 0.78.

We concluded at this stage that open-ended questions introduced a bias against patients at the R.P.A.H. clinic, being an assessment of verbal ability and recall memory, which are confounding variables in the measurement of diabetes knowledge. Recognition memory was a more valid measure, and, in this regard, the unreliability of true/false questions left the multiple-choice format as the logical alternative.

RELIABILITY ANALYSIS: SAMPLE 2

All items were translated into multiple-choice format for inclusion in a self-administered questionnaire for a new sample of 56 diabetic patients attending the diabetes clinic during the first half of 1980. Five items were deleted because it was judged that they assessed outmoded information. This sample was comparable to the first in all respects except that only one in three had attended diabetes education programs compared with 46% in the original sample. The mean score of 24.4 ± 8.7 (61%) was lower than that obtained in the first sample (76%), owing to this underrepresentation of formally educated patients in sample 2. Moreover, the scores were not directly comparable owing to the mixture of item formats in sample 1. The new set of 40 items consisted of 18 dietary and 9 general questions, 5 questions on hyperglycemia and illness, 4 on hypoglycemia, and 4 on urine testing.

Reliability analysis[25] was performed on answers to these 40 items for 56 subjects. The reliability coefficient (Cronbach's alpha) of 0.92 indicated high internal consistency. Item difficulties ranged from 0.14 to 0.93, with 35 items in the "acceptable" range of 0.30–0.90.[2] Item discrimination coefficients (i.e., item-total correlations) were between 0.15 and 0.73, with all coefficients positive. Thirty-eight items exceeded the minimum coefficient of 0.20.[2] The reliability analysis was replicated for subgroups of the full sample with no loss of reliability. For example, homogeneous samples of long-term diabetic patients ($N = 43$) had an alpha coefficient of 0.91 and IDDM patients ($N = 25$), 0.86. Mean scores on the 40 items for these subgroups were distributed as expected with long-term patients scoring highest (30.5) and newly diagnosed, lowest (19.8). Five items were deleted from the scale owing to unacceptably low item difficulty or item discrimination coefficients (0.20). The remaining 35 items had item difficulties of 0.35–0.93 and discrimination coefficients of 0.24–0.73. (Details of the reliability analysis are available from the authors on request.)

PARALLEL FORMS DKNA, DKNB, AND DKNC

Four items displayed the highest discrimination coefficients consistently for all subgroups and for the full sample. These items assessed patients' understanding of (1) the normal range for blood glucose; (2) the causes of hypoglycemia; (3) insulin requirements during illness; and (4) the status of rice as a carbohydrate food. In view of the high discrimination in areas of "basic survival information" afforded by these items, it was decided that they should be repeated in all three forms of the DKN scale. Remaining items were assigned to DKNA, DKNB, and DKNC according to the following criteria: (1) the minimum number of items for reliable knowledge assessment should be used; (2) "basic survival information" should be represented in each form; (3) items should be matched across forms for item content, item difficulty and item variance, and discrimination coefficient.

Scores on the three scales were normally distributed and analysis of variance was not significant (F = 1.03, df = 2, 165), confirming the statistical identity of the three forms. Correlations between DKNA, DKNB, and DKNC were 0.90–0.91 (P < 0.001). They confirm the essential prerequisite that parallel forms of the same scale must measure the same entity. The three scales share 80% of their variance in common. (Characteristic of scales DKNA, DKNB, and DKNC are available from the authors on request; see APPENDIX.)

CLINICAL TRIAL: SAMPLE 3

A full clinical trial of the DKN scales was conducted during 1981 to determine the effectiveness of a diabetes education program in promoting understanding of the cognitive aspects of diabetes and its management. The formal program at R.P.A.H. Diabetes Education Centre involves 1½ days of videotape-based group instruction for 6–8 diabetic patients, each accompanied by a relative or friend. The program is staffed by a full-time diabetes education officer, clinic sister, and dietitians on a rotating basis. DKNA, DKNB, and DKNC were given to all patients in an order predetermined from tables of random numbers. The DKN pretests and posttests were given immediately before and after the education program to 219 consecutive patients, this sample being representative of the clinical population as described previously. The mean DKN pretest score was 7.61 and the posttest mean was 11.27, an overall improvement of 24% (P < 0.001). Mean scores for forms A, B, and C are shown in Table 1.

Pretest scores were normally distributed in the three forms and analysis of variance was not significant (F = 0.67, df = 2,216). Posttest scores displayed marked negative skew in all forms and parametric tests for significance were therefore inappropriate. A sign test for independent samples gave a chi-square value of 14.52 (df = 2), which was significant beyond the 0.1% level. The variances of the posttests were not significantly different ($F_{A,B}$ = 1.06; $F_{A,C}$ = 1.13; $F_{B,C}$ = 1.06; crit. $F_{(0.05)}$ = 1.470). The results confirmed the parallelism of DKNA, DKNB, and DKNC for pretest administration in this sample of 219 patients. In posttest administration following the program conducted at the R.P.A.H. Diabetes Education Centre, the forms displayed the same distributional characteristics, but DKNB was found to be a more difficult test.

TABLE 1
Mean pretest and posttest scores for clinical trial of DKNA, DKNB, and DKNC: sample 3

	DKNA	DKNB	DKNC
Pretest			
N	67	72	80
Mean	8.06	7.32	7.49
SD	3.52	4.38	3.84
Posttest			
N	73	74	72
Mean	11.88	10.38	11.57
SD	2.80	2.72	2.64

DISCUSSION

The parallel forms of the DKN scale satisfy all the criteria for parallelism,[22] including the stringent addition of equal average item discrimination coefficients (0.45, 0.45, 0.47, respectively). The 0.9 correlation between forms is partly due to replication of the four "basic survival information" items. Scale variances for DKNA, DKNB, and DKNC were very similar; however, the lower mean score on DKNB observed in the reliability analysis was repeated in the subsequent clinical analysis with 219 subjects. This difference was below significance in both cases, but it reached significance in the clinical trial posttest owing to the marked reduction in DKN score variance following education.

Discussion with the program staff confirmed that at least one item in DKNB represented information which had been lately omitted from the program: item K36, on free foods (the only item to show a significant increase in item difficulty from sample 2 to the clinical trial sample), referred to food items that were no longer mentioned unless a patient specifically asked about them. For the local conditions of the R.P.A.H. program we are considering the replacement of K36 with a more reliable item.

Comprehensive assessment is necessary, but there are many contexts in which it is contraindicated. In assessing the variety of educational needs of individual patients, and in evaluative research applied to diabetes education programs, it is more important to assess knowledge rapidly and efficiently than it is to catalogue exhaustively the entire range of potential knowledge items. Our research has shown that it is possible to sample from this larger domain and to produce a brief instrument of high reliability. This by no means implies that comprehensive profiles can be neglected; the DKN scales were developed from a basis of comprehensive assessment and will rely on continuing and systematic comprehensive assessment to confirm validity and reliability of the scales under the changing conditions of program, staff, and patients.

APPENDIX

1. In uncontrolled diabetes the blood sugar is:
   A. Normal.
   B. Increased.
   C. Decreased.
   D. I don't know.
2. Which one of the following is *true*?
   A. It does not matter if your diabetes is not fully controlled, as long as you do not have a coma.
   B. It is best to show some sugar in the urine in order to avoid hypo's.
   C. Poor control of diabetes could result in a greater chance of complications later.
   D. I don't know.
3. The *normal* range for blood glucose is:
   A. 4–8 mmol/L.
   B. 7–15 mmol/L.
   C. 2–10 mmol/L.
   D. I don't know.
4. Butter is mainly:
   A. Protein.
   B. Carbohydrate.
   C. Fat.
   D. Mineral and vitamin.
   E. I don't know.
5. Rice is mainly:
   A. Protein.
   B. Carbohydrate.
   C. Fat.
   D. Mineral and vitamin.
   E. I don't know.
6. The presence of ketones in the urine is:
   A. A good sign.
   B. A bad sign.
   C. A usual finding in diabetes.
   D. I don't know.
7. Which of the following possible complications is usually *not* associated with diabetes?
   A. Changes in vision.
   B. Changes in the kidney.
   C. Changes in the lung.
   D. I don't know.
8. A diabetic on insulin who finds his urines are constantly testing brown with Diastix should probably:
   A. Stop taking insulin.
   B. Decrease his insulin.
   C. Increase his insulin.
   D. I don't know.
9. When a diabetic on insulin becomes ill and unable to eat the prescribed diet:
   A. He should immediately stop taking his insulin.
   B. He must continue to take the insulin.
   C. He should use diabetic tablets instead of insulin.
   D. I don't know.
10. If you feel the beginnings of a hypo reaction, you should:
   A. Immediately take some insulin or tablets.
   B. Immediately lie down and rest.
   C. Immediately eat or drink something sweet.
   D. I don't know.
11. You can eat as much as you like of which one of the following foods:
   A. Apples.
   B. Celery.
   C. Meat.
   D. Honey.
   E. I don't know.
12. A hypo is caused by:
   A. Too much insulin.
   B. Too little insulin.
   C. Too little exercise.
   D. I don't know.

In the last three (3) questions, there will be *more than one* correct answer. Please circle all the answers you think are correct. In each question, only circle ("I don't know") if you have no idea at all.

13. A kilogram is: (*circle at least two*)
   A. A metric unit of weight.
   B. Equal to 10 pounds.
   C. A metric unit of energy.
   D. A little more than 2 pounds.
   E. I don't know.
14. Two of the following substitutions are wrong. Which are they? (*circle at least two*)
   A. One portion (1 oz) bread = 4 sao's.
   B. One egg = one small lamb cutlet.
   C. 5 oz milk = 5 oz orange juice.
   D. Three quarters cup cornflakes = three quarters cup cooked porridge.
   E. I don't know.
15. If I don't feel like the egg allowed on my diet for breakfast I can: (*circle at least two*)
   A. Have extra toast.
   B. Substitute one small chop.
   C. Have an ounce of cheese instead.
   D. Forget about it.
   E. I don't know.

From the Department of Medicine, University of Sydney, and Diabetes Centre, Royal Prince Alfred Hospital, Camperdown, Sydney, Australia.

Address requests for copies of DKN Scales to Stewart M. Dunn, Research Psychologist, Department of Medicine, University of Sydney, Sydney, NSW 2006, Australia.

REFERENCES

[1] Davis, W. K., Hull, A. L., and Boutaugh, M. L.: Factors affecting the educational diagnosis of diabetic patients. Diabetes Care 1981; 4:275–78.

[2] Windsor, R. A., Roseman, J., Gartseff, G., and Kirk, K. A.: Qualitative issues in developing educational diagnostic instruments and assessment procedures for diabetic patients. Diabetes Care 1981; 4:468–75.

[3] Etzwiler, D. D.: What the juvenile diabetic knows about his disease. Pediatrics 1962; 29:135–41.
[4] Etzwiler, D. D., and Sines, L. K.: Juvenile diabetes and its management: family, social, and academic implications. JAMA 1962; 81:304–308.
[5] Etzwiler, D. D., and Robb, J. R.: Evaluation of programmed education among juvenile diabetics and their families. Diabetes 1972; 21:967–71.
[6] Ludvigsson, J.: Socio-psychological factors and metabolic control in juvenile diabetes. Acta Paediatr. Scand. 1977; 66:431–37.
[7] Simon, J. W., and Stewart, M. M.: Assessing patient knowledge about diabetes. Mt. Sinai J. Med. 1976; 43:189–202.
[8] Karlander, S.-G., Alinder, I., and Hellström, K.: Knowledge of diabetes mellitus, diets and nutrition in diabetic patients. Acta Med. Scand. 1980; 207:483–88.
[9] Collier, B. N., and Etzwiler, D. D.: Comparative study of diabetes knowledge among juvenile diabetics and their parents. Diabetes 1971; 20:51–57.
[10] Williams, T. F., Martin, D. A., Hogan, M. D., Watkins, J. D., and Ellis, E. V.: The clinical picture of diabetic control, studied in four settings. Am. J. Pub. Health 1967; 57:441–51.
[11] Tietz, W., and Vidmar, J. T.: The impact of coping styles on the control of juvenile diabetes. Psychiatr. Med. 1972; 3:67–74.
[12] Watkins, J. D., Williams, T. F., Martin, D. A., Hogan, M. D., and Anderson, E.: A study of diabetic patients at home. Am. J. Pub. Health 1967; 57:452–59.
[13] Doody, R. S., and Grose, N. P.: The family medical history: assessing patient understanding of diabetes mellitus. Diabetes Care 1981; 4:285–88.
[14] Delbridge, L.: Educational and psychological factors in the management of diabetes in childhood. Med. J. Aust. 1975; 2:737–39.
[15] Graber, A. O., Christman, B. D., Alogna, M. T., and Davidson, J. K.: Evaluation of diabetes patient-education programmes. Diabetes 1977; 26:61–64.
[16] Miller, L. V., Goldstein, J., and Nicolaisen, G.: Evaluation of patients' knowledge of diabetes self-care. Diabetes Care 1978; 1:275–80.
[17] Lane, D. S., and Evans, D.: Measures and methods in evaluating patient education programs for chronic illness. Medical Care 1979; 17:30–42.
[18] Watts, F. N.: Behavioural aspects of the management of diabetes mellitus: education, self-care and metabolic control. Behav. Res. Ther. 1980; 18:171–80.
[19] Green, L. W., Levine, D. M., and Deeds, S.: Clinical trials of health education for hypertensive outpatients: design and baseline data. Preventive Med. 1975; 4:417–25.
[20] Sackett, D. L., and Haynes, R. B. (Eds): Compliance with Therapeutic Regimens. Baltimore, Md., Johns Hopkins Press, 1976.
[21] Sullivan, B. J.: Self-esteem and depression in adolescent diabetic girls. Diabetes Care 1978; 1:18–22.
[22] Gulliksen, H.: Theory of Mental Tests. New York, John Wiley, 1950.
[23] Partridge, J. W., Garner, A. M., Thompson, C. W., and Cherry, T.: Attitudes of adolescents towards their diabetes. Am. J. Dis. Child. 1972; 124:226–29.
[24] Congalton, A. A.: Occupational Status in Australia. Kensington, University of N.S.W. School of Sociology, 1963.
[25] Nie, N. H., Hull, C. H., Jenkins, J. G., Steinbrenner, K., and Bent, D. H.: Statistical Package for the Social Sciences. 2d edit. New York, McGraw-Hill, 1975.