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## What Factors are Involved in the Knowledge Necessary for the Self-Management of Diabetic Patients?

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## Abstract

The aim of this study is to obtain data for improving a training program for patients with diabetes mellitus. One hundred eighty-seven patients with non-insulin dependent diabetes mellitus were tested with 20 questions about their knowledge for self-management of diabetes mellitus. Then to draw out factors in their personal backgrounds relating to their correct answers, multiple regression analyses were conducted. As a result, four factors showed significant differences in the following order: Educational careers > ages > duration of disease > socioeconomic strata. The results of the present study have shown for the first time, that these four factors closely concern patients to acquire the necessary knowledge for their self-management of the disease. In addition, this study has raised some fundamental problems regarding the training program for patients: how education should be given to patients.

**KEYWORDS:** knowledge necessary for self-management of diabetes, factors involved in the knowledge, educational career, age factors, duration of diabetes, socioeconomic strata

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## What Factors are Involved in the Knowledge Necessary for the Self-Management of Diabetic Patients?

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The aim of this study is to obtain data for improving a training program for patients with diabetes mellitus. One hundred eighty-seven patients with non-insulin dependent diabetes mellitus were tested with 20 questions about their knowledge for self-management of diabetes mellitus. Then to draw out factors in their personal backgrounds relating to their correct answers, multiple regression analyses were conducted. As a result, four factors showed significant differences in the following order: Educational careers > ages > duration of disease > socioeconomic strata. The results of the present study have shown for the first time, that these four factors closely concern patients to acquire the necessary knowledge for their self-management of the disease. In addition, this study has raised some fundamental problems regarding the training program for patients: how education should be given to patients.

**Key words:** knowledge necessary for self-management of diabetes, factors involved in the knowledge, educational career, age factors, duration of diabetes, socioeconomic strata

Knowledge for the self-management is important, because behavioral changes needed for diabetic patients to do their self-management of the disease are prompted by proper motivation and the knowledge necessary for the self-management. Such behavioral changes are required to continue for a long time.

If we know how the diabetic patients build up their knowledge about self-management of their disease, it will give us useful information in our planning and implementation of an education program for them.

We, therefore, have investigated what factors are involved in the knowledge they already have for their self-management of the disease.

### Subjects and Methods

Covered in our present study were all of the 187 patients

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(females/males = 79/108) with non-insulin dependent diabetes mellitus (MIDDM). The patients were treated between January 9, 1985 and December 27, 1986 as new patients at diabetic outpatient section of our department (Table 1). Their age was  $55.6 \pm 12.7$  years, and period of illness was  $4.3 \pm 5.4$  years. The age means one at the time of investigation, and the period of illness means the period from the time when NIDDM was found until the time of investigation. As regards their educational careers, three categories were adopted, *i.e.*, I. college graduate; II, senior high school graduate; and III. finished compulsory education. As for socio-economic strata, patients were classified into 3 groups based on the following 3 types of health insurance they belonged: I) seamen's insurance, society-managed health insurance, mutual aid association insurance; II) national health insurance; III) government-management health insurance.

In working out an education program for self-management of diabetes mellitus, it is essential to know the extent of the knowledge that diabetic patients have for self-management of their disease and to examine the factors involved in their knowledge. The extent of their knowledge was evaluated according to the correct answers they gave to our questionnaire (3).

Then, to find out factors involved in their correct answers, a

**Table 1** Personal backgrounds of 187 patients with non-insulin dependent diabetes melitus in the present study

Number of patients (F/M)	79/108
Age (year)	56 ± 12 (9~85)
Duration of diabetes (year)	4 ± 5 (0.5~25)
Family background (+/-) <sup>a</sup>	85/102
HbA <sub>1c</sub> (%)	10.9 ± 2.4 (8.2~21.2)
Nephropathy: Albustics (+/-)	36/151
Retinopathy (+/-)	25/162
Educational careers (I/II/III) <sup>b</sup>	33/77/77
Socio-economic strata (I/II/III) <sup>c</sup>	54/70/63

a: Patients with (+) and without (-) family background of diabetes melitus;  
 b: college graduate (I), senior high school graduate (II), and finished compulsory education (III); c: high (I), middle (II) and low (III).

multiple regression analysis was made.

## Results

Characteristics of the patients were as follows: The ages ranged from 9 to 85 years, with the average of 55.6 ± 12.7 years, and the period of illness ranged from 0.5 to 25 years, the average being 4.3 ± 5.4 years. Patients with family history of diabetes mellitus accounted for 45.5%. As to educational careers, 17.6%, the smallest portion of the patients came under category I, and many were under categories II and III, each representing 41.2%. As for socio-economic strata, those under group I made up 28.9% of the patients. The percentage was slightly higher in other two groups, the value being 37.4% under group II and 33.7% under group III.

The multiple regression analysis was done based on factors shown in Table 2, with the number of correct answers to the questions as a criterion variable and the 6 factors other than the correct answers as explanatory variables. The results of the analysis are shown in Table 3. Where significant differences were observed, the weights of explanatory variables were as follows:

Education > Age > Period of illness > Socio-economic strata. However, since  $R^2 = 0.1926$ , it cannot be said that this multiple regression analysis was satisfactory. The results of the analysis show that patients with higher education had larger number of correct answers, and younger patients also gave larger number of correct answers. Larger number of correct answers was also obtained from patients in higher socio-economic strata, and from those with longer period of illness.

**Table 2** Factors of patients' personal backgrounds used for multiple regression analyses

Criterion variable	
NOC (correct answers)	The number of correct answers to the questions about the knowledge of diabetes mellitus
Explanatory variable	
SEX (sex)	Male = 0 Female = 1
AGE (age factors)	Years of age
DUR (duration of disease)	Duration of disease
FAM (family background) <sup>a</sup>	Without family = 0 With family = 1
EDU (educational career)	College graduates = 1 Senior high school graduates = 2 Finished compulsory education = 3
Socioeconomic class	High = 1 Middle = 2 Low = 3

a: Patients with or without family background of diabetes mellitus.

**Table 3** Results of a multiple regression analysis<sup>a</sup> in the present study

Parameters	Coefficient	Standard error	T value	P value
Intercept	19.76663862	1.62979253	12.128	0.0001
EDU	-1.77648452	0.40946253	-4.339	0.0001
FAM	0.11775001	0.61257755	0.192	0.8478
SEC	-0.79934443	0.37953730	-2.106	0.0366
SEX	-0.07481800	0.59661966	-0.125	0.9003
AGE	-0.06455273	0.02425276	-2.662	0.0085
DUR	0.15163405	0.05809688	2.610	0.0098

a: The analysis was performed under the condition that the number of correct answers was a criterion variable while the other 6 factors were explanatory variables. (See Table 2). n = 186,  $R^2 = 0.1926$ , p = 0.0001.

## Discussion

First, we wish to examine the propriety of the methods used by us. In order for diabetic patients to show desirable behavioral changes for a long period of time, it is necessary for each of them first to have proper motivation and necessary knowledge for their self-management of the disease. By knowledge here we do not mean mere informational knowledge, but mean the knowledge associated with behavioral changes. In other words, we mean the knowledge that is necessary for the self-management of the disease and the knowledge which has already been proven to be closely related to HbA<sub>1c</sub>, a value showing the results of behavioral change (4). Thus, the knowledge investigated in our study has a scientific significance.

In classification of educational careers, we set three categories, *i.e.*, college graduate, senior high school graduate, and finished compulsory education. Judging from the present system and situation of education in Japan, we believe the above classification is practically appropriate.

Concerning the classification of patients by socio-economic stratum, what is the ideal method? At present, there is no established standard that accurately shows socio-economic strata in Japan. However, since premium and benefits provided vary with each type of health insurance, classification by health insurance is considered to be most appropriate<sup>(5)</sup>. We, therefore, classified patients' socioeconomic strata into 3 groups using the following 3 types of health insurance they belonged: I) seamen's insurance, society-managed health insurance and mutual aid association insurance, II) national health insurance, and III) government-managed health insurance. However, this stratum classification is not as clear-cut as aforementioned classification of educational careers. For example, how to rank the national health insurance is not so simple, because this insurance covers two different income groups; one is people with high income, such as self-employed people, and the other with low income. Therefore, in our present study, we examined the composition of educational careers. Namely, we examined the composition of educational careers in each group classified by health insurance, in a total of 187 subjects. In group I of socio-economic strata, there were 15 college graduates (27.8%), 25 senior high school graduates (46.3%) and 14 persons who finished compulsory education (25.9%), while group II consisted of 10 college graduates (14.5%), 27 senior high school graduates (39.1%) and 32 persons who finished compulsory education (46.4%). Group III had 8 college graduates (12.5%), 25 senior high school graduates (39.1%) and 31 persons with compulsory education (48.4%). Thus, it was considered that under the national health insurance, there are many people with high income. It is for this reason that in our present study, people belonging to the national health insurance were ranked as group II of socio-economic strata.

From the results of the multiple regression analysis, it has become clear that educational careers, socio-economic strata, ages and period of illness are involved in the knowledge they have. The fact that those with higher education or higher socio-economic strata or younger patients gave larger number of correct answers to our

questionnaire is well understood in view of their constant efforts for intellectual training of themselves (6-8). Thus, the results of the analysis were consistent with the actual situation. The longer one's period of illness becomes, the more chances he has of learning about his own disease, with resultant increase in his knowledge. Therefore, it may be said that the results of our present study show a logical consequence. Sex and family history were not significantly involved in their knowledge. This may be because the knowledge is the one mainly associated with behavioral changes. The results of our present regression analysis showed  $R^2 = 0.1926$ , indicating that analysis was not done so well. About this, we have to study what other factors are involved at another opportunity in the future.

As a result of our present study, we have been able, for the first time, to determine the factors involved in the knowledge necessary for self-management of the disease which the diabetic patients already have. This will enable us to make a more accurate preliminary evaluation of their disease in our planning of an education program for them. For example, the results of our present study will suggest us to what extent we may give logically advanced lecture to patients or the way how we should prepare the lecture for appealing more to patients' sentiment *etc.* Besides, for those with lower education or lower socio-economic strata, or elderly patients, it may be necessary to make a special educational consideration based on the results of our study, so as to enhance the effect of the therapy. If we are to follow the theory that a training based on the principle of education will have a general effect on trainees, we may not need to make a special consideration for each different background factor.

The present results clearly demonstrate for the first time that educational careers, socio-economic strata and ages are significantly involved in the knowledge of the diabetic patients concerning self-management of their disease. At the same time, the results raise a problem regarding the fundamental education: a problem of how education should be.

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