QUALITY OF LIFE IN PATIENTS WITH DIABETES MELLITUS

MASAO KANAUCHI, HISAYUKI NISHIOKA, ISAO YASHIMA, TADATOSHI KIKAWA, MAYUMI AKAI, TAKAHIRO KAWANO, KENJI ISHII, YASUO NAKASHIMA, TOSHIHIDE HIRAYAMA, KIMIAKI NISHIURA, YOSHITAKA MATSUMOTO, TOSHIO HASHIMOTO and KAZUHIRO DOHI

First Department of Internal Medicine, Nara Medical University

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Abstract: We evaluated the quality of life (QOL) in 268 patients with diabetes mellitus (NIDDM, 250 cases; IDDM, 10 cases; and other type of diabetes, 8 cases) to determine which aspects were adversely affected by the disease. Information concerning life satisfaction, social activities, ability to work, sexual problems and physical symptoms was obtained from a 30-item questionnaire. Clinical characteristics including duration of diabetes, glycemic control, current treatment, obesity, hypertension, hyperlipidemia, macro- and microvascular complications were obtained from medical records. Diminished QOL was most pronounced in patients who had had a long duration of disease, required insulin therapy, and whose health was disturbed by cerebrovascular disease, end-stage renal disease, mono- and autonomic neuropathy. A significant difference in the subdimensional QOL score was noted in life satisfaction, social activities, ability to work, sexual problems and physical symptoms under these circumstances.

Index Terms

diabetes mellitus, insulin therapy, quality of life

INTRODUCTION

The number of patients with diabetes mellitus and the prevalence of diabetic complications have dramatically increased in recent years. In the past, major problem for management of diabetic patients were how to provide treatment for better glycemic control and how to decrease diabetic complications. Although prolongation of life remains important, current interest has shifted to the quality of life (QOL). Increased disability is associated with not only physical complaints, but also poorer psychosocial adjustment to the illness. An assessment of their QOL has been emphasized in the clinical management of these patients, but little information is available concerning satisfaction with their lives[1-3]. The purpose of this study is to provide some information about the QOL in diabetic patients, and to ascertain what variables affect QOL.

PATIENTS AND METHODS

Patients

A total of 268 patients with diabetes mellitus who had sought medical attention from physicians within the First Department of Internal Medicine at the Nara Medical University Hospital or six associated institutions were enrolled in this study. The subjects were 136 male

patients and 132 female patients, aged 21 to 88 years (mean 62 years). The clinical backgrounds of these subjects are given in Table 1.

Assessment of QOL

The QOL assessment was dependent on a 30-item questionnaire consisting of 9 items assessing life satisfaction, 6 items assessing social activities, 3 items assessing work performance, 2 items assessing sexual dysfunction and 10 items assessing physical symptoms (Table 2). This questionnaire was modified from the QOL questionnaire of Geriatric Medicine of Osaka University Medical School[4]. It required patients to use a 3-point scale (0, good or satisfactory ; 1, fair or occasionally present ; 2, poor or progressive worsening). Both the total QOL score and the individual QOL dimension were calculated.

Clinical data

Information regarding the duration of diabetes, glycemic control, current treatment, obesity, hypertension, hyperlipidemia, cerebrovascular disease (CVD), ischemic heart disease (IHD), peripheral vessel disease (PVD), diabetic retinopathy, nephropathy and neuropathy were obtained from medical records. Using the criteria described in Table 3, subjects were divided into two to four categories. Obesity was defined as a body mass index (BMI) of 26.5% or

Table 1. Background of subjects

Items		Number	(%)
Gender	male	136	(50.7)
	female	132	(49.3)
Age	20-29	2	(0.7)
	30-39	7	(2.6)
	40-49	29	(10.8)
	50-59	68	(25.5)
	60-69	89	(33.2)
	70-79	58	(21.6)
	>80	15	(5.6)
Type	NIDDM	250	(93.3)
	IDDM	10	(3.7)
	Others	8	(3.0)
Therapy	Diet only	66	(24.6)
	Oral agent	119	(44.4)
	Insulin	83	(31.0)

Table 2. Questionnaire for QOL assessment

1. Satisfaction with living?
2. General well-being?
3. Dissatisfaction with the future?
4. Feeling good about themselves?
5. Tired on awakening?
6. Difficulty in falling asleep?
7. Anxiety
8. Depression
9. Night mares
10. Frustrated by the illness?
11. Jitters due to your illness?
12. Satisfaction with family life?
13. Having close friends?
14. Difficulties with finances due to the illness?
15. Having hobbies?
16. Concentration on work?
17. Performance and satisfaction with work?
18. Fatigue during work?
19. Interest in the opposite gender?
20. Sexual potency
21. Appetite
22. Headache or head heaviness
23. Dizziness or fainting
24. Dry mouth
25. Shoulder stiffness
26. Palpitation
27. Shortness of breath
28. Numbness
29. Edema
30. Visual disturbance

higher[5]. Hypertension was defined according to WHO guidelines[6]. The patient receiving treatment with antihypertensive drugs was also classified into the hypertensive group. Hyperlipidemia was classified as a serum cholesterol concentration of 220 mg/dl or higher and /or a serum triglyceride concentration of 150 mg/dl or higher. CVD was defined as documented history of transient ischemic attack or stroke due to cerebral infarction or cerebral hemorrhage. IHD was identified by classical symptoms of angina pectoris and documented myocardial infarction. PVD was identified by a standard questionnaire for lower-limb claudication or gangrene. The grade of diabetic retinopathy was determined by ophthalmoscopy and classified as no retinopathy, simple retinopathy, preproliferative retinopathy or proliferative retinopathy. Diabetic nephropathy was divided into four clinical stages: normoalbuminuria, microalbuminuria, overt proteinuria and end-stage renal disease requiring hemodialytic support. Diabetic neuropathy was divided into four categories: no neuropathy, mononeuropathy, polyneuropathy and autonomic neuropathy.

Statistical analysis

Data are expressed as the mean±SD. The means of groups were compared by analysis of variance (ANOVA) and differences between groups were tested using the Fisher's exact test. Statistical significance was assumed at $p < 0.05$.

RESULTS

The total QOL score

The results of the total QOL score are shown in Fig. 1. The total QOL score showed a significant increase with respect to prolonged history of diabetes. No significant difference in the total QOL score was observed within the different levels of glycemic control. However, the total QOL score was significantly higher in the group who received insulin therapy versus an oral hypoglycemic agent. No significant difference was observed in the total QOL score

Table 3. Categorical grade of each variable

Variables	Category			
	I	II	III	IV
Duration of diabetes (years)	< 10	10-19	≧ 20	
Glycemic control (HbA_{1c} value; %)	< 7.0	7.0-8.9	≧ 9.0	
Therapy	diet only	oral agent	insulin	
Obesity	absent	present		
Hypertension	absent	present		
Hyperlipidemia	absent	present		
CVD	absent	TIA	stroke	
IHD	absent	abnormal ECG	AP or MI	
PVD	absent	claudication	gangrene	
Retinopathy	absent	simple	preproliferative	proliferative
Nephropathy	normo-albuminuria	micro-albuminuria	overt proteinuria	on hemodialysis
Neuropathy	absent	mono-neuropathy	poly-neuropathy	autonomic neuropathy

Abbreviations are: CVD, cerebrovascular disease; IHD, ischemic heart disease; PVD, peripheral vascular disease; TIA, transient ischemic attack; AP, angina pectoris; MI, myocardial infarction.
Stroke include cerebral infarction and hemorrhage.

between the groups with obesity, hypertension or hyperlipidemia. The total QOL score was significantly higher in those who had had a stroke than in the group without CVD. However, no significant difference among the three groups was observed regarding IHD. An increase in the total QOL score in those with gangrene was observed, but was not statistically signifcant. No significant difference in the total QOL score was documented despite the severity of diabetic retinopathy. The total QOL score was significantly higher in patients requiring maintenance hemodialysis than in the other three groups. It was also significantly higher in groups associated with either mononeuropathy or autonomic neuropathy than in those without neuropathy.

The subdimensional QOL score

In order to study which dimension may have the greatest contribution to the total QOL score, a subdimensional QOL score was evaluated for the duration of diabetes, treatment modality, CVD, diabetic nephropathy or diabetic neuropathy (Table 4). A significant difference in the subdimensional QOL score was noted in life satisfaction, ability to work and physical symptoms among the three groups when correlated with the duration of diabetes. Those patients requiring insulin therapy had a significantly higher score in physical symptoms than those

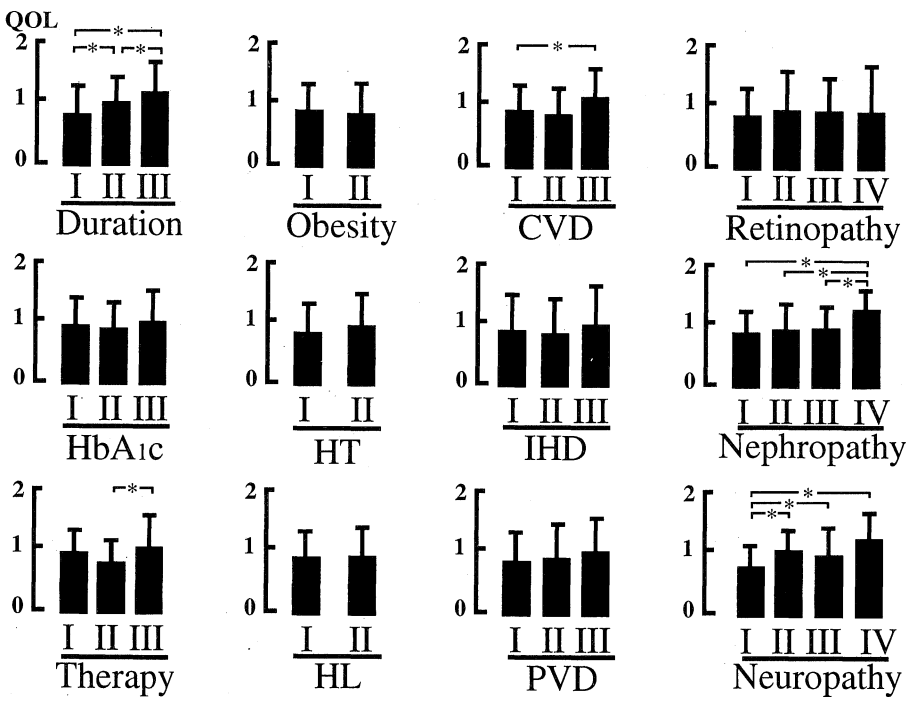

Fig. 1. Total QOL score.
Abbreviations are: HT, hypertension; HL, hyperlipidemia; CVD, cerebrovascular disease; IHD, ischemic heart disease; PVD, peripheral vascular disease.
Categorical gradings of I, II, III and IV as in Table 3.
* $p<0.05$

Table 4. Subdimensional QOL score with special attention to each group concerning duration of diabetes, therapy, cerebrovascular disease, nephropathy or neuropathy

Dimension	Categorical grading	Life satisfaction	Social activity	Work performance	Sexual problem	Physical symptom
Duration	I	0.75±0.41	0.68±0.45	0.74±0.63 *	1.06±0.63	0.55±0.41 *
	II	0.81±0.41 *	0.82±0.39	0.81±0.60	1.31±0.58	0.54±0.31 *
	III	0.99±0.47 *	1.02±0.51	1.03±0.70	1.53±0.52	0.62±0.40 *
Therapy	I	0.79±0.42	0.76±0.43 *	0.76±0.66 *	1.23±0.61	0.57±0.41 *
	II	0.76±0.90	0.67±0.45	0.74±0.62	1.09±0.64 *	0.55±0.41 *
	III	0.87±0.44	0.90±0.47	0.90±0.62	1.26±0.65	0.57±0.31 *
CVD	I	0.79±0.42	0.74±0.46 *	0.79±0.63 *	1.14±0.64 *	0.57±0.38 *
	II	0.74±0.49	0.71±0.44	0.67±0.61 *	1.28±0.61	0.43±0.31 *
	III	0.91±0.44	0.99±0.41	0.94±0.71 *	1.61±0.43	0.59±0.36 *
Nephropathy	I	0.78±0.43	0.74±0.45	0.74±0.65	1.16±0.64	0.55±0.41
	II	0.83±0.41	0.72±0.46 **	0.85±0.60	1.02±0.65 *	0.58±0.34
	III	0.76±0.42	0.78±0.47 **	0.87±0.62	1.33±0.60 *	0.51±0.33 *
	IV	0.93±0.41	1.02±0.38	0.88±0.64	1.40±0.56	0.73±0.35 *
Neuropathy	I	0.72±0.39 * *	0.72±0.48 *	0.73±0.62 *	1.13±0.67 *	0.49±0.36 *
	II	0.91±0.39 *	0.80±0.41	0.94±0.65	1.17±0.58	0.62±0.35 *
	III	0.88±0.41 *	0.79±0.42 *	0.77±0.61 *	1.22±0.60 *	0.64±0.35 *
	IV	1.02±0.52	0.96±0.46	1.07±0.67	1.48±0.52	0.75±0.51

Categorical grading as shown in Table 3. * $p<0.05$

taking an oral agent. Patients who had had a stroke also had a significantly higher score in physical symptoms and were adversely affected in their ability to work. Patients who were maintained on hemodialysis demonstrated a significantly higher score in social activities, sexual problems and physical symptoms than the other three groups. Among the patients with diabetic neuropathy, a significant difference in the QOL score was observed in life satisfaction, social activities, ability to work, sexual problems and physical symptoms.

DISCUSSION

Treatment for diabetes often requires important changes in lifestyle. It has been suggested that a diabetic patient's self-care may help maintain health and reduce the risk of diabetic complications. Failure to improve upon the lifestyle may lead to inadequate glycemic control. Emotions, such as anxiety, depression and poor self-confidence, have also been shown to be associated with poor glycemic control. Patients are also affected by the severity of illness, its duration and complications, as well as by familial and social supports. Whether or not these patients have a satisfactory life has yet to be determined. We have tried to provide some information about the QOL of diabetic patients and to address the aforementioned problems.

The influence of clinical characteristics, such as treatment modality and macro- and microvascular complications, is considerable. Jacobson et al.[3] reported that insulin treatment was associated with lower levels of satisfaction and greater impact on QOL. In our study, the total QOL score was significantly higher in the group requiring insulin therapy. However, Karlson and Agardh[7] have reported that an intensified insulin regimen (using a pen-style injector) has had favorable effects on the QOL compared with the conventional method using syringes. Additional about the improvement of insulin delivery systems are required.

With regards to obesity, hypertension and hyperlipidemia, all groups shared similar total QOL scores in our study. It is known that anti-hypertensive therapy produces an improvement in the QOL in patients with essential hypertension[8]. In the present study, the patient receiving treatment with antihypertensive drugs was also classified into the hypertensive group. Including these patients may have led to a lack of significant difference in the total QOL score between the two groups. The same reasoning may also explain the lack of difference between the groups with normo- and hyperlipidemia.

On the other hand, a significantly higher total QOL score was observed in patients with CVD, but not IHD or PVD. Some explanations may be given for these findings. Since stroke patients focused on their difficulty with mobility, they were less satisfied with their health and daily life. The results of the present study are in accordance with the report by Astrom[9]. Indeed IHD, especially acute myocardial infarction, are fatal diseases. However, recent advances in intervention therapy may improve mortality, relieve symptoms, increase activity of daily life, and eventually achieve improvement in QOL. In contrast, arteriosclerosis obliterance and diabetic gangrene are sad complications and stressful situations. The QOL of patients with these complications must be expected to decrease drastically. However, in our study, the difference among the three PVD groups was not significant. Since the number of patients with PVD was small, a larger patient population is required to address this question adequately.

The onset of microvascular complications is a critical point in the life of diabetic patients. When patients are faced with microvascular complications, they believe that good control is of no further value. In particular, visual impairment appears to contribute to the poor QOL. The burden of vision loss may impact strongly on the patient's lives. However, visual acuity may remain excellent despite even marked proliferative retinopathy, until macular edema or vitreous hemorrhage occurs[10]. Therefore, in our study, no correlation between the severity of diabetic retinopathy and total QOL score was observed. In patients with diabetic nephropathy who have microalbuminuria and even overt proteinuria, troublesome symptoms are usually rare. Thus, in our study, the total QOL score was similar among the groups with normoalbuminuria, microalbuminuria and overt proteinuria. Several investigators have also described the major psychosocial consequence of severe non-diabetic renal disease[11-15]. However, few studies have examined the specific psychosocial consequence of renal disease in diabetics[16,17]. In diabetic patients who can adjust their lifestyles for hemodialysis, factors such as social support, financial change, ability to work and the perceived illness may contribute to the decrease in QOL[16]. In our cases, the total QOL score was significantly higher in the group who received maintenance hemodialysis than in the other three groups. Sensory polyneuropathy is the most common diabetic complication of the nervous system. Most patients have mild symptoms of polyneuropathy which consist of numbness or paresthesia. When neuropathic pain becomes severe, patients become increasingly depressed and express fear, anger and resentment resulting in a decrement of QOL. Mononeuropathy may occur on the basis of focal ischemia, entrapment or trauma to a superficial nerve. Peroneal mononeuropathy produces a sudden painless foot drop. Cranial mononeuropathies give rise to ophthalmoplegia, diplopia, ocular pain, impaired olfaction and facial paralysis[18]. These symptoms also can diminish the QOL in diabetic patients. Autonomic neuropathy is the most troublesome feature. A broad spectrum of symptoms affect cardiovascular, gastrointestinal, urogenital and thermoregulatory

function[19]. In the present study, the total QOL score in patients with mono- and polyneuropathy or autonomic neuropathy was significantly increased in comparison to patients without neuropathy. With regard to the specific dimensions of QOL, diabetic nephropathy correlated closely with social activities, sexual problems and physical symptoms. Diabetic neuropathy also correlated with life satisfaction, social activities, work performance, sexual problems and physical symptoms.

We conclude that a diminished QOL is most pronounced in diabetic patients who have had a long duration of disease, required insulin therapy, suffered from cerebrovascular diseases, undergone dialysis and/or had a disease to course complicated by a mono- and polyneuropathy or autonomic neuropathy.

REFERENCES

1) **The DCCT Research Group** : Reliability and validity of a diabetes quality of life measure for the Diabetes Control and Complication Trial. Diabetes Care **11** : 725-732, 1988.
2) **Wredling, R., Adamson, U., Berne, C., Dahlen, M., Ostma, J., Larsson, Y.** and **Stalhammar, J.** : Quality of life among a representative sample of people with diabetes mellitus in Sweden. Diabetes Nutr. Metab. Clin. Exp. **6** : 393-395, 1993.
3) **Jacobson, A. M., DeGroot, M.** and **Samson, J. A.** : The evaluation of two measures of quality of life in patients with type I and type II diabetes. Diabetes Care **17** : 267-274, 1994.
4) **Ogihara, T., Mikami, H., Otsuka, A., Nagano, M., Masuo, K., Saeki, S., Morishita, R., Suzuki, T., Naka, T.** and **Hata, T.** : Effect of nilvadipine on quality of life in patients with essential hypertension. Curr. Ther. Res. **51** : 154-162, 1992.
5) **Bray, G. A.** : Overweight is risking fate. Ann. N. Y. Acad. Sci. **499** : 14-28, 1987.
6) **Guidelines Sub-Committe** : 1993 Guidelines for the management of mild hypertension ; memorandum from a World Health Organization / International Society of Hypertension meeting. J. Hypertens. **11** : 905, 1993.
7) **Karlson, B.** and **Agardh, C. D.** : Influence of intensified insulin regimen on quality of life and metabolic control in insulin-dependent diabetes mellitus. Diabetes Res. Clin. Pract. **25** : 111-115, 1994.
8) **Croog, S. E., Levin, S.** and **Testa, M. A.** : The effects of antihypertensive therapy on the quality of life. N. Engl. J. Med. **314** : 1657-1664, 1986.
9) **Astrom, M.** : Psychosocial function and life satisfaction after stroke. Stroke **23** : 527-531, 1992.
10) **Aiello, L. M.** and **Cavallerano, J. D.** : Ocular complications of diabetes mellitus. *in* Joslin's Diabetes Mellitus (Kahn, C. R. and weir, G. C., eds.). 13th ed., Lea & Febiger, Malvern, p 771-793, 1994.
11) **Levy, N. B.** and **Wymbrandt, G. D.** : The quality of life on maintenance hemodialysis. Lancet **2** : 1328-1330, 1975.
12) **De-Nour, A. K.** and **Shanan, J.** : Quality of life of dialysis and transplanted patients. Nephron **25** : 117-120, 1980.
13) **Johnson, J. P., McCauley, C. R.** and **Copley, J. B.** : The quality of life of hemodialysis and transplant patients. Kidney Int. **22** : 286-291, 1982.
14) **Evans, R. W., Manninen, D. L., Garrison, L. P., Hart, L. G., Blagg, C. R., Gutman, R. A., Hull, A. R.** and **Lowrie, E. G.** : The quality of life of patients with end-stage renal disease. N. Engl. J. Med. **312** : 553-559, 1985.
15) **Bremer, B. A., McCauley, C. R., Wrona, R. M.** and **Johnson, J. P.** : Quality of life in end-stage renal disease. Am. J. Kidney Dis. **13** : 200-209, 1989.
16) **Comty, C. M.** : Psychosocial problems in dialyzed diabetic patients. Kidney Int. **6** (Supple. 1) : 144-151, 1976.

17) **Devins, G. M.**: Illness intrusiveness and quality of life in end-stage renal disease. Health Psychol. **9**: 117-142, 1990.

18) **Fraser, D. M., Campbell, I. W., Ewing, D. J.** and **Clarke, B. F.**: Mononeuropathy in diabetes mellitus. Diabetes **28**: 90-101, 1979.

19) **Ewing, D. J.** and **Clarke, B. F.**: Diabetic autonomic neuropathy; present insights and future prospects. Diabetes Care **9**: 648-665, 1986.