Original Article

Determinants of dietary self-care behaviours among Taiwanese patients with type 2 diabetes

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The effects of patient characteristics on reported adherence to dietary self-care behaviours in 184 Taiwanese outpatients 40 years or older with type 2 diabetes was assessed. Patient characteristics included the presence of predisposing factors affecting diabetes adherence (knowledge and attitudes about the disease, self-efficacy, and the absence of psychological problems), enabling factors (understanding of diabetes and environmental factors affecting it), and reinforcing factors (presence of medical and social support) which were evaluated using a 72 item self-administered questionnaire with 8 subscales. Adherence was assessed by patients' reports of carrying out 7 self-care behaviours (following a diabetic meal plan, following the diabetes exchange system, eating meals providing the same amount of carbohydrate every day, counting carbohydrates, reducing dietary fat, consuming high fiber foods, and keeping a daily food record). Reported adherence ranged from 17% to 74%. No single predisposing, enabling, or reinforcing factor predicted adherence to all of the dietary self-care behaviours. However, more self-efficacy, better understanding, and a better attitude toward diabetes were associated with performing five or more of the dietary self-care behaviours examined. With respect to specific self-care behaviours, women were more likely than men to count carbohydrates (OR=5.75) and reduce fat in their diets (OR=2.57). Patients who attended more nutrition education sessions were more likely to follow diabetes meal plans (OR=2.11) and the diabetes exchange system (OR=3.07). Efforts are needed to encourage providers to teach diabetes self-care behaviours to patients and to capitalize upon demographic and psychosocial characteristics that can enhance patient adherence.

Key Words: type 2 diabetes mellitus, Taiwan, self-care behaviours, patient education, dietary adherence

INTRODUCTION

Type 2 diabetes is a major financial and social burden as well as a leading cause of disability and medical costs worldwide.[1] The incidence and prevalence of type 2 diabetes has increased dramatically over the past decade in Asia, and 2025 projections are that more than 60% of the global population with diabetes will be Asian.[2] Taiwan is an Asian country that exemplifies these trends, with diabetes as the fifth leading cause of years of life lost and the third leading cause in disability adjusted life years (DALYs) in the country in 2010. When compared with seventeen other East Asian, Southeast Asian, and Asian Pacific counties, Taiwan had the second highest rate of DALYs from diabetes in the region, and the highest percent of DALYs from diabetes (4.8%).[1] The Taiwanese Nutrition and Health Survey found that the annual prevalence of type 2 diabetes diagnosed in adults rose by 43% in less than a decade, from 5.8% in 2000 to 8.3% in 2007.[3] Today, over one million Taiwanese have diabetes and the disease accounts for 12% of the country's healthcare expenditures.[4] Most Taiwanese with type 2 diabetes still do not meet disease management goals[4] and poor glycemic control is common, increasing the risk of diabetic complications.[5] When patients understand and practice diabetes self-care, disease management is more likely to be effect-tive.[6]

Self-care involves daily activities that individuals perform to keep their illness under control and to minimize its impact on their health, functioning, and life.[6,7] Those who adhere to medical and dietary self-care recommendations often achieve a sense of well-being and control over their disease, while maintaining a high quality of life and minimizing diabetes complications.[8] However, motivating patients to achieve high self-care adherence is challenging, and poor adherence, especially to dietary self-care behaviours, is common in many chronic diseases,

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Manuscript received 01 September 2015. Initial review completed and accepted 05 September 2015.
doi: 10.6133/apjcn.2015.24.3.02

including diabetes.[9,10]

Many patients find it difficult to incorporate complex diabetes self-care behaviours into their lifestyles.[4,11,12] Several characteristics have been identified that may improve adherence to diabetes self-care behaviors.[13] Factors internal to the patient that may predispose them to better adherence include certain demographic factors (sex, age, and education level), increased knowledge of the pathology of diabetes, as well as psychological factors such as a more positive attitude toward managing the illness, more self-efficacy, and no or few psychological problems. External factors in the larger environment that may help to reinforce self-care behaviours may include fewer environmental barriers, more family support, and more medical support.[13] To the best of our knowledge, the influence of these characteristics on adherence of patients with diabetes in Taiwan has not been studied.

The goal of this study was to identify demographic, psychological, and environmental determinants of adherence to seven diet related diabetes self-care behaviours among Taiwanese adults who had received at least one individualized dietitian-led nutrition education session and a nurse-led session as part of their diabetes care.

METHODS

Design

This single center, cross-sectional, observational study of adult outpatients diagnosed with type 2 diabetes was conducted at the National Taiwan University Hospital (NTUH) in Taipei, Taiwan. The study was approved by both the Human Investigation Review Committee of the National Taiwan University Hospital and Tufts Medical Center. Eligible participants provided written informed consent prior to their participation.

Sample

185 outpatients with type 2 diabetes were recruited from the outpatient diabetes clinic at the National Taiwan University Hospital in 2003. Eligible participants (1) were over 40 years of age, (2) had been diagnosed with type 2 diabetes for more than two years, (3) had attended at least one individualized dietitian-led nutrition education session and one nurse-led diabetes education session at the hospital as part of their diabetes care by the time of the study, and (4) had at least two hemoglobin A_1c levels recorded in the year prior to enrollment in their medical records.

Questionnaires

Patients completed a Factors Affecting Diabetes Self-Care (FADSC) questionnaire to describe demographic, social, and environmental characteristics that were thought to be predisposing, enabling, or reinforcing factors possibly affecting diabetes self-care. They also completed a Diabetes Self-Care Behavior (DSCB) questionnaire to assess adherence to 7 self-care behaviors relating to diet. The questionnaires were self-administered, or interviewer-assisted, if required. Mean time for completion was 30 minutes.

Factors Affecting Diabetes Self-Care Questionnaire (FADSC)

The FADSC was a self administered questionnaire to assess the extent to which predisposing, enabling, and reinforcing factors affected adherence to diet related aspects of diabetes self-care. It was developed by the author and reviewed by members of the Taiwan Association of Diabetes Educators to ensure that it was valid, clear, and stylistically and culturally appropriate for Taiwanese patients. The FADSC consisted of eight subscales, with 72 questions total. Seven of the eight subscales were scored using a 5 point Likert scale (attitude, self-efficacy, psychological, understanding, environmental/situational barriers, family support, and medical support) and one subscale (knowledge) was measured using multiple choice questions. Possible scores ranged from 0 to 30 points, with higher scores reflecting a more positive effect. The FADSC assessed predisposing factors by examining diabetes knowledge, attitudes about diabetes, self-efficacy, and the lack of or absence of psychological problems. To determine enabling factors, patients' understanding of the disease and barriers reported in the environment were examined. Reinforcing factors were assessed by determining family and medical support. The tool had acceptable reliability and validity in a Taiwanese patient population with an average test-retest reliability for the total scale (0.82, $p<0.001$), good internal consistency (Cronbach's $\alpha=0.62$-0.87), and satisfactory test-retest reliability (Pearson correlation coefficients $r=0.70$-0.94, $p<0.03$). This measure was validated in an unpublished manuscript by Ouyang et al.

Diabetes Self-Care Behaviour Questionnaire (DSCB)

This questionnaire was created by the author to documents patients' reports of the self-care recommendations they had received from their health care providers and adherence to seven reported diet related self-care behaviours, including: (1) following a diabetic meal plan, (2) having meals every day at the same time and with the same amount of carbohydrate, (3) following the diabetes exchange system, (4) counting carbohydrates, (5) reducing dietary fat, (6) consuming foods high in fiber, and (7) keeping a daily food record. Items questioning each of these behaviours were constructed using a 5 point Likert scale to rank responses. In order to construct dichotomous variables from the frequency of self-care behaviours, 'often' and 'always' were considered *high adherence* and 'sometimes', 'seldom' and 'never' were categorized as *low adherence.*

Statistical analysis

All analyses were performed using SPSS version 13.0. Descriptive statistics included patient characteristics that were considered to be potential predictors of self-care adherence included demographics (age, gender, educational level) and background characteristics relating to diabetes (duration of diabetes, diabetes medications, how many times the participant received a dietitian-led nutrition education at the hospital, and the presence of acute and chronic diabetes complications). Odds ratios derived from logistic regression analysis were used to identify predictive factors that resulted in high frequency of reported dietary self-care behaviour adherence and to predict the extent to which participant demographics affected

the frequency of performing dietary self-care behaviours. Odds ratios for the latter analyses were adjusted for sex, age and education level.

RESULTS

One hundred and eighty five eligible patients completed the two questionnaires (Table 1). Their mean age was 65.2 (SD 10.5) years, most were men (54%), and had an educational level of high school or less (71%). The majority had been diagnosed with diabetes for more than 10 years (65%). They had a mean BMI of 25.0 (SD 3.3) and a mean hemoglobin A_{1c} of 7.8% (SD 1.5). Most (68%) of the patients were receiving oral anti-diabetic agents, and 31% were taking insulin, 25% had experienced at least one acute complication, and 44% had chronic complications related to diabetes. The patients had attended a mean of 2.0 (SD 1.4) dietitian-led nutrition education sessions and a mean of 1.9 (SD=1.3) nurse-led sessions, and 60% of the patients had received two or more dietitian-led nutrition education sessions after being diagnosed with diabetes.

Patient report of their health care providers' recommendations on dietary self-care

Health care providers did not advise patients to follow all of the diet related self-care behaviours with equal frequency, according to patient report (Table 2). The vast majority of patients reported that they had been advised to follow a diabetic meal plan (90%), reduce dietary fat (86%), increase dietary fiber (86%), and consume similarly sized meals at the same time each day (85%), but that their health care providers less frequently advised them to use diabetes exchange lists (51%), count carbohydrates (22%), or keep a daily food record (22%).

Table 1. Characteristics of 185 Taiwanese outpatients with type 2 diabetes in the dietary self-care behaviour survey

Characteristic	n (%)
Sex	
Men	100 (54)
Women	85 (46)
Age, y	
40-59	58 (31)
60-69	58 (32)
≥70	68 (37)
Formal education	
None or elementary school	71 (38)
Middle school or high school	62 (33)
Some university	52 (29)
Duration of diabetes, years	
<10	65 (35)
10-15	58 (31)
>15	62 (34)
Treatment	
Hypoglycemic agents (but not taking insulin)	127 (69)
Insulin	58 (31)
Experienced acute complications†	
No	138 (75)
Yes	47 (25)
Experienced chronic complications‡	
No	101 (56)
Yes	80 (44)
Number of nutrition education sessions received	
One	71 (40)
More than one	105 (60)

†Acute diabetes complications included: hypoglycemia or hyperglycemic non-ketotic coma (HHNK).
‡Chronic diabetes complications including: retinopathy, neuropathy, nephropathy, amputation or diabetes related cardiovascular disease.

Levels of patient adherence among patients who were advised to follow self-care behaviours

Patients who had been advised to follow the dietary self-care behaviours were more likely to perform them than those whose health care providers had not recommended that they do so (Table 2). For example, patients advised to follow self-care behaviours were more likely to "often" or "always" increase dietary fiber intake (74%), reduce dietary fat (70%), follow a diabetic meal plan (61%), and eat meals at the same time and of the same size daily (56%). In contrast, patients were less like to count carbohydrates (40%), follow the diabetes exchange list (36%), or keep a daily food record (17%). Thus, even when patients were advised to follow certain self-care behaviours, these behaviours were imperfectly adhered to.

Associations of patients' demographic and other characteristics with dietary self-care behaviours

None of the characteristics examined predicted adherence to all the dietary self-care behaviours investigated. However, statistically significant associations were found between some of the demographic characteristics and adherence to specific dietary self-care behaviours (Table 3). For example, women were more likely than men to count carbohydrates (OR=5.75) and reduce their consumption of dietary fat (OR=2.57). Middle-aged adults between the ages of forty and fifty-nine were less likely than more elderly adults aged seventy and above to have meals at the same time daily (OR=0.30), to reduce their fat consumption (OR=0.20), and to consume high fiber foods (OR=0.35). Patients with less than six years of education were less likely than those with more than twelve years of education to follow diabetic exchanges (OR=0.18), count carbohydrates (OR=0.01), reduce fat consumption (OR=0.32), and eat higher fiber foods (OR=0.20). Also, patients with seven to twelve years of education were less likely than those with more than twelve years of education to have meals at the same time and of the same amount of carbohydrate daily (OR=0.42), count carbohydrates (OR=0.16), reduce fat consumption (OR=0.33), and eat high fiber foods (OR=0.35).

Clinically relevant patient characteristics were also associated with adherence to dietary self-care behaviours. Those who did not use insulin as part of their treatment were more likely than insulin users to consume foods high in fiber (OR=3.22). Attending more than one nutrition education session was positively associated with following a meal plan for diabetes (OR=2.11) and following the exchange system for diabetes (OR=3.07).

Having acute complications related to diabetes (such as hypoglycaemia or hyperosmolar hyperglycemia non-ketotic coma) was positively associated with consuming similarly sized meals at the same times daily (OR=2.35). However, having chronic complications such as retinopa-

Table 2. Frequency of following various dietary self-care behaviours by 185 type 2 diabetes outpatients in Taiwan

Component of dietary self-care behaviours	Advised to follow behaviour during diabetes education sessions	Never n (%)	Seldom n (%)	Sometimes n (%)	Often n (%)	Always n (%)	Total n (%)
Followed diabetes meal plan	Advised	10 (5)	16 (9)	39 (21)	56 (30)	45 (24)	166 (90)
	Not advised	3 (2)	2 (1)	7 (4)	5 (3)	2 (1)	19 (10)
Had meals at approximately the same time and amounts daily	Advised	4 (2)	23 (12)	38 (21)	47 (25)	46 (25)	158 (85)
	Not advised	3 (2)	4 (2)	8 (4)	6 (3)	6 (3)	27 (15)
Followed diabetes exchange list	Advised	19 (10)	20 (10.5)	21 (11)	13 (7)	21 (11)	94 (50.5)
	Not advised	78 (41)	5 (3)	5 (3)	1 (.5)	2 (1)	91 (49.5)
Counted carbohydrate	Advised	9 (5)	8 (4)	7 (4)	6 (3)	10 (5)	40 (22)
	Not advised	124 (67)	8 (4)	9 (5)	1 (1)	3 (2)	145 (78)
Reduced fat consumption	Advised	6 (3)	12 (7)	30 (16)	58 (31)	53 (29)	159 (86)
	Not advised	6 (3)	3 (2)	4 (2)	6 (3)	7 (4)	26 (14)
Increased fiber intake	Advised	6 (3)	9 (5)	26 (14)	62 (34)	56 (30)	159 (86)
	Not advised	5 (3)	5 (3)	2 (1)	8 (4)	6 (3)	26 (14)
Kept a food record daily	Advised	22 (12)	7 (4)	5 (3)	4 (2)	3 (2)	41 (22)
	Not advised	130 (70)	7 (4)	5 (3)	2 (1)	0 (0)	144 (78)

Table 3. The effects of various patient characteristics on adherence to various dietary self-care recommendations among 185 Taiwanese outpatients with type 2 diabetes[†]

Demographic variables		Adjusted odds ratios (95% confidence interval)						
		Followed meal plan	Had meals at the same time and amount daily	Followed diabetes exchange system	Counted carbohydrate	Reduced fat consumption	Ate high fiber foods	Recorded food intake in a diet diary
Sex (women vs men)		1.71 (0.80, 3.65)	1.23 (0.57, 2.64)	1.80 (0.72, 4.47)	5.75 (1.27, 26.1)	2.57 (1.11, 5.96)	1.90 (0.81, 4.47)	1.42 (0.24, 8.30)
Age, years	40-59 vs ≥70	0.56 (0.24, 1.29)	0.30 (0.13, 0.72)	0.54 (0.20, 1.51)	0.66 (0.17, 2.53)	0.20 (0.08, 0.50)	0.35 (0.14, 0.90)	0.46 (0.08, 2.74)
	60-69 vs ≥70	1.09 (0.47, 2.54)	0.57 (0.24,1.34)	0.57 (0.21,1.56)	0.46 (0.10, 2.22)	0.44 (0.17,1.10)	0.58 (0.23, 1.48)	0.19 (0.02, 2.25)
Education level	≤6 yr vs >12 years of school	0.89 (0.35, 2.25)	0.66 (0.26, 1.70)	0.18 (0.06, 0.57)	0.01 (0.001, 0.15)	0.32 (0.11, 0.93)	0.20 (0.07, 0.64)	0.15 (0.02, 1.20)
	7-12 yr vs >12 years of school	0.98 (0.42, 2.30)	0.42 (0.17, 0.99)	0.38 (0.15, 1.01)	0.16 (0.05, 0.60)	0.33 (0.13, 0.85)	0.35 (0.13, 0.96)	0.10 (0.01, 1.08)
Duration of	<10 vs >15	0.92 (0.37, 2.28)	0.78 (0.31, 1.97)	1.06 (0.35, 3.15)	0.11 (0.02, 0.77)	0.79 (0.30, 2.07)	0.61 (0.22, 1.68)	0.59 (0.06, 5.33)
Diabetes, years	10-15 vs >15	1.10 (0.46, 2.63)	0.79 (0.32, 1.90)	1.00 (0.35, 2.88)	0.64 (0.17, 2.45)	0.82 (0.33, 2.06)	1.04 (0.40, 2.74)	1.63 (0.25, 10.8)
Diabetes treatment (no insulin vs. insulin)		1.61 (0.73, 3.54)	1.98 (0.89, 4.39)	1.57 (0.60,4.09)	1.33 (0.40, 4.43)	2.22 (0.97,5.08)	3.22 (1.37, 7.57)	2.12 (0.32, 14.0)
Acute complications[‡] (yes vs no)		0.76 (0.35, 1.64)	2.35 (1.02, 5.41)	1.60 (0.64, 4.00)	0.83 (0.24, 2.91)	1.18 (0.51, 2.76)	1.26 (0.52, 3.02)	1.54 (0.30, 8.05)
Chronic complications[§] (yes vs no)		0.33 (0.17, 0.66)	0.32 (0.16, 0.65)	0.69 (0.30, 1.57)	0.82 (0.27, 2.52)	0.48 (0.23, 0.99)	0.46 (0.22, 0.99)	1.11 (0.24, 5.08)
Received nutrition education sessions (>1 vs 1)		2.11 (1.06, 4.22)	1.76 (0.88, 3.55)	3.07 (1.22, 7.69)	1.31 (0.41, 4.25)	0.93 (0.45, 1.95)	0.96 (0.45, 2.05)	0.69 (0.15, 3.17)

[*]Significant results ($p<0.05$) are bolded and italicized.
[†]Odds ratios were calculated from high frequency of performing the behaviour (often + always) versus low frequency (never + seldom + sometimes) for different dietary recommendations patients followed.
[‡]Acute complications: patients had experienced with hypoglycemia or hyperosmolar hyperglycemia non-ketotic coma (HHNK).
[§]Chronic complications: patients had diabetes chronic complications such as retinopathy, neuropathy, nephropathy, amputation, diabetes related cardiovascular diseases or others.

thy, neuropathy, nephropathy, amputation, or diabetes related cardiovascular disease were negatively associated with following a meal plan (OR=0.33), having similarly sized meals at the same times daily (OR=0.32), reducing dietary fat consumption (OR=0.48), and eating foods high in fiber (OR=0.46). Duration of diabetes only modestly affected adherence; those diagnosed with diabetes for less than ten years were somewhat less likely to count carbohydrates (OR=0.11) than those who had been diagnosed with diabetes for more than fifteen years.

Effects of internal and external influences on patients' adherence to dietary self-care

The frequency of adherence to certain dietary self-care behaviours was significantly affected by several internal influences (Table 4). Especially noteworthy is self efficacy, which was positively associated with six of the seven dietary self-care behaviours. Patients who had a better understanding of the dietary self-care behaviours and better attitudes toward the disease were also more likely to be adherent on five of the seven dietary self-care behaviours. Strong and statistically significant associations with adherence were also apparent among patients who reported fewer psychological problems on four of the seven dietary self-care behaviours. In contrast, having more knowledge about diabetes was not associated with an increase in the frequency of performing any self-care behaviour examined.

Three external factors influenced adherence to some degree, as measured by the frequency of performing certain dietary self-care behaviours (Table 4). Patients reporting fewer environmental barriers were more likely to follow a meal plan for diabetes and have meals of the same amount at the same time daily than those with more environmental barriers. However, having more family or medical support did not result in a statistically significant effect on adherence to any of the seven dietary self-care behaviours.

DISCUSSION

Dietary self-care behaviours continue to be important for preventing disease progression and poor outcomes for people with type 2 diabetes.[9] In the Taiwanese population, advising patients about necessary self-care behaviours and then helping them to implement them may be beneficial in mitigating the side effects of this chronic disease.[6,9] Our findings support these prior observations in Taiwanese patients.

Patients are unlikely to know how to perform complex dietary self-care unless they received advice from a healthcare provider.[9] Yet, the vast majority of patients reported that their providers had not advised them to use carbohydrate counting or to keep a daily food record, and only half of the patients had been advised to follow a diabetes exchange list.[4] Whether failure to advise patients on self-care behaviours was because providers judged patients incapable of or unwilling to use the techniques, or whether it resulted from the providers themselves being unfamiliar with or dubious about the efficacy of these tools in this population is unknown, but should be determined in future studies, and if necessary more population or culture specific strategies should be devised. In contrast, healthcare providers very commonly recommended other behaviours such as following a diabetes meal plan, having meals at approximately the same time and amounts daily, reducing dietary fat, and increasing fiber intakes.

We observed, as in earlier studies,[8] that patients' practice of self-care behaviours was imperfect and even those given advice on dietary self-care rarely adhered to all of the recommendations most of the time. In this study the levels of adherence to four self-care behaviours were relatively high, but far from perfect. This suggests that when patients understand recommendations they can put them into practice on a fairly consistent basis.[6] In contrast, the three other dietary self-care behaviours were rarely recommended by providers or followed by patients.

Healthcare professionals can better tailor their counselling and education sessions to meet patient needs if the demographic and psychosocial characteristics of patients that have an impact on adherence to dietary self-care behaviours are understood.[6,14] In our study age and sex were associated with dietary self-care behavioural adherence, and our results suggest that educational level or the presence of acute and chronic complications may relate to adherence. These factors should be considered in designing individualized education tailored to the patient's circumstances and abilities.[4,6] Another study that examined the self-care practices of Chinese individuals with type two diabetes, found that the majority of their study population with suboptimal blood glucose control were considered to have deficits in diabetes related knowledge.[6] Some patients may require special educational materials at appropriate literacy levels to assist them. Counselling that is tailored to patients' individual needs may better prepare them to meet present and future challenges than a "one size fits all" approach to dietary counselling and nutrition education.[6,15]

An important finding in the present study was that both internal (eg: better attitudes about diabetes) and external (eg: fewer environmental barriers) influences improved adherence to the seven dietary self-care behaviours we assessed. Taiwanese patients who understood their disease were more likely to have high self-efficacy, a good attitude, and fewer psychological problems and were more likely to perform more of the dietary self-care behaviours more frequently.[4] Many internal factors improving adherence among Taiwanese type 2 diabetics can be influenced by personalized dietary and medical counselling by health care providers.[4] However, we found that for many patients, mastering these diet related self-care behaviours appeared to require more instruction and education than could be provided in a single nutrition counselling session, and yet only 60% of the patients in this study received more than one nutrition education session. These findings suggest that individuals with type 2 diabetes who find it difficult to implement dietary self-care behaviours should be encouraged to attend multiple nutrition education sessions that are geared to the exigencies of their disease to help them to more fully incorporate these self-care behaviours into their lifestyles. Taiwanese patients with type 2 diabetes may benefit from registered dietitian-led sessions on the management of diabetes.[16]

We found that many patient characteristics predicted

Table 4. The effects of various factors affecting frequency of following different dietary self-care recommendations among 185 Taiwanese type 2 diabetes outpatients, adjusted odds ratios[†]

Factors influencing frequency of self-care	Odds ratios (95% confidence interval)						
	Following meal plan	Having meals at the same time and amount	Following diabetes exchange system	Counting carbohydrate	Reducing fat consumption	Eating high fiber	Recording food intake
Internal factors							
Increased knowledge	1.31 (0.99, 1.73)	1.28 (0.97, 1.68)	1.29 (0.92, 1.79)	1.37 (0.87, 2.16)	1.07 (0.80, 1.42)	1.35 (1.00, 1.83)	1.40 (0.77, 2.54)
Better understanding	1.15 (1.05, 1.25)	1.09 (1.01, 1.18)	1.14 (1.02, 1.27)	1.15 (1.00, 1.33)	1.18 (1.07, 1.30)	1.20 (1.09, 1.33)	1.18 (0.96, 1.46)
Better attitude	1.10 (1.05, 1.16)	1.07 (1.02, 1.13)	1.08 (1.01, 1.14)	1.05 (0.98, 1.13)	1.07 (1.01, 1.13)	1.12 (1.05, 1.19)	0.98 (0.88, 1.09)
More self-efficacy	1.21 (1.11, 1.33)	1.19 (1.09, 1.30)	1.16 (1.05, 1.29)	1.21 (1.06, 1.38)	1.26 (1.14, 1.40)	1.28 (1.15, 1.42)	1.08 (0.91, 1.28)
Fewer psychological problems	1.13 (1.05, 1.22)	1.13 (1.04, 1.22)	1.05 (0.96, 1.15)	1.06 (0.94, 1.20)	1.11 (1.03, 1.21)	1.15 (1.06, 1.25)	1.04 (0.88, 1.22)
External factors							
Fewer environmental barriers	1.03 (1.01, 1.05)	1.02 (1.01, 1.04)	1.03 (1.00, 1.05)	1.03 (0.96, 1.07)	1.02 (0.99, 1.04)	1.02 (0.99, 1.04)	1.03 (0.97, 1.08)
More family support	1.01 (0.97, 1.05)	0.98 (0.94, 1.02)	0.95 (0.91, 1.00)	0.97 (0.92, 1.03)	1.00 (0.96, 1.05)	1.04 (0.99, 1,08)	0.98 (0.90, 1.07)
More medical support	1.01 (0.95, 1.08)	0.99 (0.93, 1.06)	1.00 (0.92, 1.09)	0.90 (0.80, 1.02)	1.03 (0.96, 1.11)	1.04 (0.96, 1.11)	0.91 (0.77, 1.07)

[†]Odds ratios were calculated by using logistic regression as high frequency of self-care (often + always) versus low frequency (never + seldom + sometimes) for a one-point change in a five-point scale for different dietary recommendations. All data were adjusted by sex, age, education level.

adherence to dietary self-care behaviours and recognition of them can assist health professionals in creating individualized counselling and education sessions that will maximize a patient's chances of controlling their diabetes.[15] Of course, it should be remembered that dietary self-care behaviours are only one of many self-care behaviours such as medication use, exercise, and self-monitoring of blood glucose that also must not be neglected to improve glycemic control.[15]

Conclusion

Self-care continues to be an important intervention, helping patients to lead active and satisfying lives, even as medical and technological support for patients with type 2 diabetes increases.[12] We found that many healthcare providers in this study failed to advise patients to carry out several of the less straightforward self-care behaviours, such as carbohydrate counting, using diabetes exchange lists, and keeping a food record. Dietary self-care behaviours are not intuitive and they must be taught to patients. It is important to ensure that health care providers receive ample education and coaching to feel comfortable using these tools and that they be adapted to be more culturally appropriate if necessary.[17]

Self-efficacy was the factor most consistently associated with increased dietary self-care behaviours, although patients' better understanding, better attitudes toward their illness, fewer reported psychological problems, and the presence of fewer environmental barriers also affected different dietary self-care behaviours in some subgroups of patients. Therefore, Taiwanese diabetes and nutrition programs should consider putting more emphasis on the development of patient self-efficacy through the design, funding, and implementation of culturally appropriate programs that empower patients to manage this chronic disease through diet-related and other self-care behaviours.

ACKNOWLEDGEMENTS

This study was supported with grants and resources from the National Taiwan University Hospital, Taipei, Taiwan. Support was received from the Fund for Research and Teaching, Frances Stern Nutrition Center at Tufts Medical Center, Boston MA and by the U.S. Department of Agriculture, Agricultural Research Service, under agreement No. 58-1950-0-014.

AUTHOR DISCLOSURES

The authors have no conflict of interest to declare.

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Original Article

Determinants of dietary self-care behaviours among Taiwanese patients with type 2 diabetes

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台湾 2 型糖尿病病患饮食自我照顾行为之决定因素

此研究调查了 184 位门诊 40 岁以上之 2 型糖尿病病患，评估病患特质对饮食自我照顾行为配合度之影响。利用一份 72 题（共八面向）之调查问卷，评估病患之特质，包括影响糖尿病患配合度之内在因素（此疾病相关之知识与态度、自我效能和心理问题）、能力因素（对糖尿病的理解度和环境因素），以及加强因素（医疗和家庭支持）。有关病患饮食自我照顾行为之配合度，共调查了七项饮食行为（遵循糖尿病饮食计划、食物代换表、每餐固定醣量、醣类计算、减少油脂、增加纤维摄取，和记录饮食日志）。病患饮食行为配合度调查结果为 17%至 74%。没有单一（内在、能力和加强）因素可预测所有的饮食行为配合度；然而，自我效能越强、理解度越佳、和有较好糖尿病的态度，则与五项以上的饮食行为配合度表现相关。特别的自我照顾行为，如女性在醣类计算上可能较男性佳（OR=5.75），在减少脂肪摄取上亦同（OR=2.57）；病患参加较多次的营养教育课程，则较可能遵循糖尿病饮食计划（OR=2.11），和糖尿病食物代换（OR=3.07）。需鼓励卫教者对糖尿病自我照顾行为教育的努力，和留意在病患人口统计学与社会心理学特质上的价值，以提升病患的配合度。

关键词：2 型糖尿病、台湾、自我照顾行为、病患教育和饮食配合度