AWARENESS AND PRACTICES OF SELF-MANAGEMENT AND INFLUENCE FACTORS AMONG INDIVIDUALS WITH TYPE 2 DIABETES IN URBAN COMMUNITY SETTINGS IN ANHUI PROVINCE, CHINA

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Abstract. This study aimed to determine the knowledge of diabetes, practices of self-management (SM), and potential factors influencing patient knowledge and practices of self-management among individuals with type 2 diabetes in urban Anhui Province, China. A cross-sectional study was conducted between October and November, 2009. Three hundred sixty-five subjects with type 2 diabetes were randomly selected from three urban communities in three seperate cities. An interview was conducted to determine subject knowledge regarding diabetes, practices of self-management, and potential factors influencing this knowledge and these practices of self-management. Fewer than half of subjects (45.6%) had a basic knowledge of diabetes and 49.7% practiced adequate self-management. Significant associations were found between subject knowledge of diabetes and their education level (OR 2.096, 95% CI 1.578-2.784) and the length of disease (OR 1.307, 95% CI 1.016-1.681). Those with good self-management were influenced by greater knowledge, (OR 2.057,95% CI 1.228-3.445), strong self-efficacy in diabetes self-management (OR 1.899, CI 1.253-2.878), and household income (OR 0.537, 95% CI 0.419-0.689). Factors found by univariate analysis regarding self-management included: glucose monitoring was influenced by perception of social support (p=0.006), adherence to medication was influenced by attitude toward self-management (p<0.001), physical activity was influenced by knowledge (p<0.01), attitude (p<0.01), self-efficacy (p<0.01), and social support (p<0.01). However, there were no factors significantly related to healthy dietary practices. Our findings show that best performance in self-management is achieved when those with type 2 diabetes have a high degree of knowledge of diabetes, positive attitudes toward diabetes, strong self-efficacy for self-management and perceptions of good social support.

Keywords: type 2 diabetes, awareness, practices, influence factors, China

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INTRODUCTION

The prevalence of diabetes worldwide is estimated to rise from 171 million in 2000 to 366 million in 2030 (Wild *et al*, 2004). There are particularly disturbing trends in Southeast Asia and China where greater urbanization, changes in diet and exercise as a result of economic prosperity and increasing rates of obesity have led to a steep increase in the incidence of type 2 diabetes (Gu *et al*, 2005; Li *et al*, 2005). The WHO projects diabetes deaths will double between 2005 and 2030; almost 80% of diabetes deaths occur in low and middle-income countries (WHO, 2009). Diabetes and its complications have a significant economic impact on individuals, families, health systems and countries. It was estimated by the WHO during 2006-2015, China will lose USD558 billion in national income due to heart disease, stroke and diabetes alone (WHO, 2009).

A national survey in China in 1996 reported the prevalence rates of diabetes and impaired glucose tolerance (IGT) were 3.21% and 4.76%, respectively, three times higher than ten years previously (1.04% and 1.30%, in 1986), and the number of patients is rising by nearly 2 million every year (Wang and Xiang, 1998). In China there are currently 40 million people with diabetes. The incidence among those aged 15-74 years increased from 0.67% in the early 1980s to 3.21% in the mid 1990s (Pan *et al*, 1994) and then 6-7% in 2001-2002-(Dong *et al*, 2005). The WHO predicts China will become home to the second largest population of diabetes in the world (King *et al*, 1998). China is facing a serious epidemic of diabetes.

Anhui Province is located in eastern China with an area of 139,600 km^2, and a total population of 64.6 million (Anhui Province, 2010). According to a province wide survey by Yang *et al* (1997) in 1995, the prevalence of diabetes mellitus was 2.24% and IGT was 4.45%. Yang predicted these numbers would increase rapidly because the elderly and obese population increases annually in Anhui Province.

Diabetes mellitus (DM) is a chronic disease in which the patient benefits from self-management. The patient's health status outcome and quality of life depend on whether the patient manages themselves well. Self-management refers to the individual's ability to manage the symptoms, treatment, physical and psychosocial consequences and life style changes inherent in living with a chronic condition (Barlow *et al*, 2002). Diabetes self-management (SM) refers to an individual's ability to sustain effective management of their behaviors: taking prescribed medications, following diet and exercise regimens, blood glycemic self-monitoring, and coping emotionally with the rigors of living with diabetes (Lorig and Holman, 2003). The goals of diabetes self-management are to optimize metabolic control, prevent acute and chronic complications, and optimize quality of life while keeping costs acceptable (Norris *et al*, 2001).

Diabetes self-care/management education and intervention have been considered important for preventing patient complications and poor outcomes. However, most Chinese adults with diabetes do not manage their whole disease well. Studies indicate about 67.8% of diabetes patients have complications (Pan, 1995), and 78% of diabetes patients suffer from more than one complication (Pan, 2002). A national cross-sectional survey was carried out in 49 central hospitals located in 30 provinces of China in 2001; only 11.5% of patients exhibited satisfactory blood glycemic control (HbA1c<6.5) (Pan, 2002). Consequently, individuals with type 2

diabetes in China are presented with the challenges of self managing health care to prevent or minimize diabetes related complications.

Evidence demonstrates that psychosocial factors, such as patient knowledge (Scott *et al*, 2002), attitudes (Ferguson, 1988), self-efficacy (Bandura, 1977, 1998), social networks and social support (Glasgow *et al*, 1988) are important determinants influencing diabetic patient self-management practices (Leonard *et al*, 1999). Studies carried out in China identified several factors contributing to patient health outcomes among diabetic patients, such as knowledge and self-efficacy (Yang, 2002; Fu, 2003). Other possible associated factors are patient age, income, occupation, level of education, length of disease and co-morbid conditions (Zheng *et al*, 2006; Shi *et al*, 2007). However, little Chinese literature has evaluated factors such as knowledge, attitudes, self-efficacy and social support influencing diabetic patient self-management practices, especially behaviors in terms of healthy diet, exercise, glucose monitoring and adherence to medication regimen.

The objective of this study, was to identify potential factors influencing diabetes self-management practices (such as healthy diet, exercise, glucose monitoring and adherence to medication regimen) in urban China. The results of this study will guide modifications to program strategies and materials for community-based peer support program (CPSP) training curricula. The findings will also help to conceptualize and develop intervention strategies and activities of CPSP that are likely to be culturally acceptable in China.

MATERIALS AND METHODS

Study setting and population

This study was conducted in Anhui Province, China. Anhui Province is located in eastern China with an area of 139,600 km^2, and had a total population of 64.6 million by the end of 2004 (Anhui Province, 2010). The province has 105 counties and 17 main cities. Three cities were sampled: Hefei City, Tongling City and Bangbu City.

Study population consisted of individuals with type 2 diabetes who participated in the "Community Non-communicable Disease Management System" and who met the following conditions: 1). he/she lived in the sampled community more than one year and was aged ≥15 years, 2). he/she had been diagnosed with type 2 diabetes, 3). the diagnostic criteria for diabetes were based on criteria of the WHO (WHO, 1999): a fasting plasma glucose (FPG)>7.0 mmol/l and a two hour postprandial plasma glucose (2 hr PPG) >11.1 mmol/l.

Subject recruitment and sampling

The study design was cross-sectional. Three communities were sampled from 3 cities in Anhui Province. A stratified sampling technique was used: 3 cities were sampled from 17 cities from 3 different geographic areas, then 1 community was randomly sampled from each of the 3 cities: Rendong Community of Tonglin City, Daqin Community of Bangbu City, and Heyedi Community of Hefei City. The study subjects were recruited by the Community Health Service Center (CHSC). Medical records of the diabetic patents living in urban community settings are prepared and managed by CHSC through annual health examinations.

Cluster sampling was conducted in the communities. Individuals with type 2 diabetes recorded at the CHSC who met criteria for the study population were the study subjects. The staff of CHSC contacted patients to explain the study purpose and procedure. After the patient made a decision to participate, the patient's name

was added to the program participants' admission list. Three hundred sixty-five individuals with type 2 diabetes were recruited from 3 communities. Details of the study were explained to the participants and informed consent was obtained from each object.

Sample size

The sample size was calculated using the following formula (Lwanga and Lemeshow, 1991):

$$n = \frac{Z^2_{1-\alpha/2}\, P(1-P)}{d^2}$$

Where n=minimum number of subjects, P=proportion with current self-management practices, which was 0.35, obtained from the previous study in China (Fu *et al*, 2003), which found approximately 35% of diabetes patients reported self-management behavior. $Z_{1-\alpha/2}$ =1.96 at α=0.05, d=absolute precision=0.05. The calculated sample size was at least 349.

Instrument description and data collection

The study instruments used were developed by the Michigan Diabetes Research Training Center (MDRTC) (http://www.med.umich.edu/mdrtc/profs/survey.html) and modified by researchers to the Chinese people (such as diet and exercises items). The questionnaire consisted of seven parts. The first part asked about social demographics (*eg*, sex, age, ethnicity, education level, occupation, married status, monthly income); the second part asked about health status (*eg*, smoking or not, alcohol consumption, length of diagnosis with diabetes, complications, type of insurance, hospitalization during the previous three months); the third section asked about knowledge of diabetes (*eg*, blood glucose, healthy diet, complications and insulin); the fourth part asked about practices of self-management (*eg*, healthy diet, exercise, glucose monitoring and adherence to medication regimen); the fifth, sixth and seventh sections asked about attitudes towards diabetes, self-efficacy regarding diabetes SM and perceptions about social support for diabetes SM, respectively.

There were 12 items for the parts relating to knowledge (questions with one correct answer from the four selections). There were 9 items for the parts relating to practices of self-management, attitude, self-efficacy and social support; these items were rated on a five-point Likert scale, with higher ratings indicating a positive attitude, higher self-efficacy and better social support.

The questionnaire was pretested and revalidated at the Daoxingchun Community (a community with similar characteristics to the study area). Some of the questions were rephrased for clarity based on observations made during the pretest. The reliability of the questionnaire was tested with 45 individuals with type 2 diabetes in Daoxingchun Community in Hefei City, Anhui Province which was not included in this research project. Responses were analyzed for Cronbach's alpha coefficiency. The results for internal consistency were 0.8774 for knowledge, 0.8154 for SM practices, 0.8415 for attitude, 0.8614 for self-efficacy and 0.8114 for social suport.

Face to face interviews were conducted in each of the 3 community by interviewers trained by researchers.

Data analysis

Social demographic and health status characteristics of the study subjects were presented as frequencies, percentages, means, and standard deviations. Data were analyzed using the statistical software program SPSS®, version 13.0 using

a significance level of 0.05 and a study power of 80%.

Twelve questions were asked to assess knowledge of diabetes, 4 of them to assess knowledge about glucose; 3 about diabetic complications; 2 about diet and 3 about insulin. Responses to knowledge questions were classified as correct or incorrect. Total scores were converted to mean score (total score 12). A score of ≥7 was defined as "having good knowledge", and a score <7 was "having poor knowledge" as applied in the National Health Literacy Survey (Wang *et al*, 2010).

Nine questions were asked to assess practices of SM. Four questions was asked to assess "healthy diet"; 2 items about "physical exercise", 2 questions about "monitoring glucose" and 1 question about "adherence medication". Ordinal responses were scored as 1-5. Total scores were converted to a mean score (total score 45). A score of 4 regarding practices of SM was defined as a healthy diet (mean score ≥16), exercise (mean score ≥8), glucose monitoring (mean score ≥8) and adherence to medication regiment (≥4). A mean score ≥36 was defined as "performing adequate SM," and a mean score <36 as "not performing adequate SM" as applied in an earlier study (Zhang *et al*, 1995).

To assess attitude, 9 questions were asked. Ordinal responses (strongly agree, agree, not sure, disagree, and strongly disagree) were given scores of 5, 4, 3, 2 and 1, respectively. Level of attitude was calculated from the mean scores and grouped into three classes 36-45 =positive, 27-35 =neutral and 9-26=negative. The overall attitude was presented as a mean score.

To assess the level of self-efficacy, nine questions were asked. Ordinal responses (strongly have, have, not sure, don't have, and strongly don't have) were scored as 5, 4, 3, 2 and 1, respectively, for level of self-efficacy. The level of self-efficacy was calculated from the mean scores and grouped into three classes: 36-45 = good confidence, 27-35 = average confidence, 9-26= low confidence. Overall self-efficacy was presented by mean scores.

To assess the level of perception of social support, 9 questions were asked. Ordinal responses (always, often, sometimes, occasionally, and never) were scored as 5, 4, 3, 2 and 1, respectively. Level of social support was calculated from mean scores and grouped into three classes: 36-45 = good support, 27-35 = average support and 9-26 = poor support. The overall level of support was presented by mean scores.

Binary logistic regression was used to determine the association between knowledge and practices of SM by age, total monthly household income, level of education and length of disease.

Binary logistic regression was used to determine the association between practice of SM and knowledge, attitudes, self-efficacy and social support. Model fitness was checked by the Hosmer-Lemeshow goodness-of-fit test and ROC curve.

Information collected was kept confidential using numbers and codes, Ethical approval was obtained from the Ethics Committee for Human Research, Faculty of Public Health, Mahidol University (Proof Number: MUPH 2010-079).

RESULTS

Three hundred sixty-five subjects were interviewed (male 50.1% and female 49.9%). The mean age of subjects was 63 years (SD 9.4). The majority were ethnic Han (97.8%); most of them had an education level that was either primary school and illiterate (44.4%) or junior high school

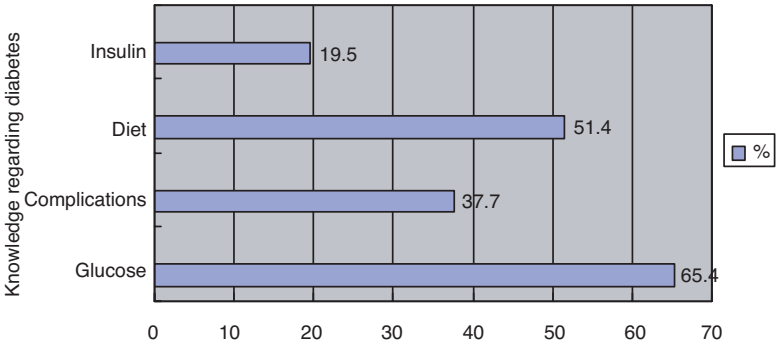

Fig 1–Percentage of correct responses for knowledge about diabetes.

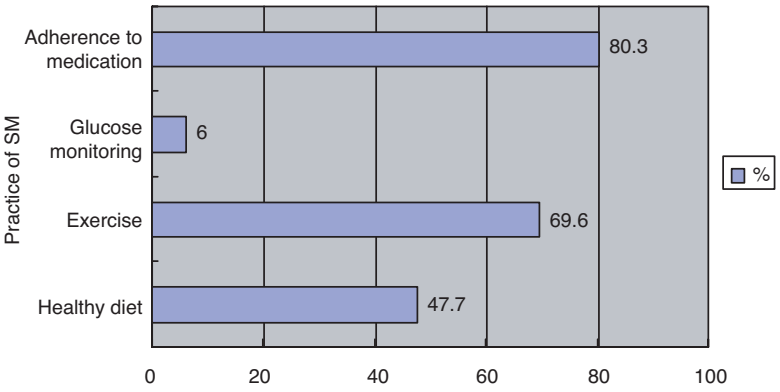

Fig 2–Percentage of respondents performing SM.

(30.1%); 62.8% of study subjects were retired; 86.0% were married. More than 60% of study subjects had a household monthly income <2,000 Yuan RMB (RMB: RenMinBi, Chinese currency) (27% had a monthly income of 2,000-4,999 Yuan RMB, 41% had a monthly income of 1,000~1,999 Yuan RMB and 23% had a monthly income of <900 Yuan RMB). Their mean length of time of disease was 6.81 years (SD 6.0).

The smoking rate (daily) was 18.6% in males and 10.1% in females, and alcohol consumption (daily) was 7.1% in males and 0 in females. Thirty-four percent of study subjects had diabetic complications, and 9.6% had been admitted to the hospital during the previous 3 months.

The total mean knowledge score was 5.48 (SD 2.68) out of a possible of 12; 45.6% of subjects had a mean score ≥7. Forty-five point six percent had a good knowledge level about diabetes. Two-thirds of respondents (65.4%) had a knowledge of blood glucose. About half of respondents (51.4%) reported correct items for diet; one-third (37.7%) were aware of complications; 19.5% had a knowledge of insulin (Fig 1).

The total mean SM score was 32.37 (SD 1.82) out of possible 45; 49.7% had a mean score ≥36. The total "practice of SM" was 49.7%. Most subjects (80.3%) were able to adhere to the medication regimen. More than two-thirds of subjects (69.6%) exercised. fewer then half the subjects (47.7%) had healthy dietary habits, and only 6.0% of respondents monitored their glucose (Fig 2).

Binary logistic regression was used to determine the association between knowledge and practice of SM by age, income, level of education, length of disease and complications. The knowledge level was significantly influenced by education level and length of disease. Patients with a higher level of education or a longer length of disease had a better knowledge

Table 1
Model for socio-demographic factors associated with awareness of knowledge and practices of SM by multiple logistic regression.

Variables	B	S.E.	Wald	*p*-value	Adjusted OR	95% CI
Knowledge						
Level of education	0.740	0.145	26.135	<0.001	2.096	1.578-2.784
Length of disease	0.268	0.128	4.352	0.037	1.307	1.016-1.681
Practice of SM						
Income	-0.621	0.127	23.896	<0.001	0.537	0.419-0.689

Table 2
Model for psychosocial factors associated with SM by multiple logistic regression.

Variables	B	S.E.	Wald	*p*-value	Adjusted OR	95% CI
Knowledge	0.721	0.263	7.509	0.006	2.057	1.228-3.445
Attitude	0.068	0.170	0.158	0.691	1.070	0.766-1.494
Self-efficacy	0.641	0.212	9.135	0.003	1.899	1.253-2.878
Social support	0.021	0.157	0.018	0.892	1.021	0.751-1.389

Practice of SM mean score >36 for 1, score <36 for 0

about diabetes. The practice of SM was significantly influenced by patient income: the higher the income the more likely to practice SM (Table 1).

Binary logistic regression was used to determine association between the practice of SM as a whole and knowledge, attitude, self-efficacy and social support. The results reveal a knowledge of diabetes and self-efficacy were significant factors influencing SM among subjects (Table 2).

Practice of healthy diet, moderate exercise, glucose monitoring, and adherence to medication regimen were categorized into 2 groups (performance group and non-performance group) by the mean score based on the items reported. The SM scores from highest to lowest were: healthy diet (mean score ≥16), exercise (mean score ≥8), glucose monitoring (mean score ≥8) and adherence to medication regimen (≥4). Univariate analysis showed glucose monitoring was significantly influenced by social support (p<0.01); adherence to medication regimen was influenced by attitude (p<0.001); and exercise was influenced by knowledge (p<0.01), attitude (p<0.01), self-efficacy (p<0.01) and social support (p<0.01) (Table 3).

DISCUSSION

Less than half the study subjects (45.6%) had a sufficient knowledge of diabetes (glucose, diet, complications, and insulin). This finding was lower than the 76.7% reported in a similar study by Fu *et al* (2009). The percentage of subjects who had a knowledge of blood glucose was the highest (65.4%), followed by healthy diet (51.4%), complications (37.7%) and knowledge about insulin (19.5%). The knowledge about glucose was higher than the

Table 3
Univariate analysis showing factors influencing healthy diet, exercise, glucose monitoring and adherence to medication regimen.

	Healthy diet			Exercise			Glucose monitoring			Adherence to medication regimen		
	<16 (X±S)	≥16 (X±S)	*t* (*p*)	<8 (X±S)	≥8 (X±S)	*t* (*p*)	<8 (X±S)	≥8 (X±S)	*t* (*p*)	<4 (X±S)	≥4 (X±S)	*t* (*p*)
N(%)	189 (52.1)	174 (47.9)		110 (30.1)	254 (69.6)		343 (94.0)	22 (6.0)		69 (18.9)	293 (80.3)	
Knowledge	5.22±2.74	5.73±2.62	1.79 (0.08)	4.27±2.64	5.98±2.55	-5.84 (<0.01)	5.44±2.71	5.95±2.36	-0.87 (0.38)	5.45±2.41	5.50±2.76	-0.15 (0.88)
Attitude	27.42±6.88	28.08±5.69	-1.01 (0.31)	25.86±5.76	28.56±6.49	-3.77 (<0.01)	27.59±6.31	29.59±7.61	-1.42 (0.16)	30.25±6.05	27.13±6.34	3.71 (<0.001)
SE	34.98±4.15	35.52±5.23	1.09 (0.27)	32.70±4.47	36.35±4.41	-7.25 (<0.01)	35.17±4.77	36.68±4.19	-1.45 (0.15)	35.58±4.84	35.23±4.68	0.56 (0.58)
SS	30.48±6.07	31.29±8.48	1.05 (0.29)	29.88±6.96	31.39±7.66	-1.79 (<0.01)	30.66±7.36	35.14±7.75	-2.76 (<0.01)	31.96±8.14	30.64±7.25	1.32 (0.19)

From independent *t*-test: level of significant was set at 0.05; *N*, number of subjects: X±S: Mean±SD; SE, Self-efficacy: SS, Social support

11.8% reported by Yin *et al* (2003). A knowledge about complications and insulin were lower than the 90.71% and 56.28% reported by Fu *et al* (2009).

In our study, subject education level, length of time with disease were significantly associated with knowledge of diabetes; subject with a higher education level and a longer time with the disease had a greater awareness of SM (OR=2.096, $p<0.001$ and OR=1.307, $p<0.05$). These findings are similar to previous studies (Mao *et al*, 2006; Zheng *et al*, 2006; Shi, 2007). Chan *et al* (1999) found patients with high education levels were more knowledgeable of and had better compliance with SM and had better glycemic control than patients with lower education levels. Zheng *et al* (2006) and Shi (2007) found a significant association between knowledge and patient age, income, occupation, and comorbidity. This may be explained by the fact that most of the subjects in our study were retired (62.8%) age ≥ 60 years (63±9.4), and the majority had similar incomes (64% under 2,000 RMB). This shows that social demographic characteristics need to be considered when developing diabetes SM programs for Chinese people with type 2 diabetes.

About half the subjects (49.5%) in our study were able to perform SM. Most subjects (80.3%) followed the doctor's prescription for medication. This figure is higher than the 68.1% reported by Yin *et al* (2003) and the 57.6% reported by Zhou *et al* (1999).

More than two-thirds of the subjects (69.6%) exercised regularly (five times per week, at least 30 minutes per time); this finding is high compared to the 35.6% reported by Zhou *et al* (1999). This may be because most of the subjects in our study were retired living in a community; they had more time to exercise. Of those who exercised, most said exercise had been a part of their life before they were diagnosed with diabetes.

Fewer than half of subjects (47.7%) had a healthy diet, similar to the 43.2% reported by Zhou *et al* (1999). This is concerning, since a healthy diet is an essential component of diabetes SM (Boehm *et al*, 1997).

Only 6.0% of subjects performed glucose monitoring regularly. This finding is lower than the 59.0% reported by Zhou *et al* (1999) and the 39% reported by Pan (2002). Some reasons may be that most of our subjects were retired (62.8%) with lower income, and the majority of them (58%) had basic medical insurance for urban residents, and glucose monitoring is not included in the health insurance. According to the qualitative survey, some patients responded: "we must pay all by ourselves, and we cannot afford it". The studies by Pan (2002) and Zhou *et al* (1999) were hospital patients; their monitoring test was paid by medical insurance.

Those three factors significant for SM were income (OR=0.537, $p<0.001$), knowledge (OR=2.057, $p=0.006$) and self-efficacy (OR=1.899, $p=0.003$) for SM practice. A greater knowledge of diabetes and self-efficacy leads to improved SM. A previous study showed patients with a lower knowledge of disease and SM had significantly fewer correct SM skills (Williams *et al*, 1998) and had worse glycemic control and higher hospitalization rates (Powell *et al*, 2007). Self-efficacy is a key component influencing SM behavior among individuals with diabetes (Bandura, 1998). Self-efficacy has been successfully applied to understanding a range of health behaviors and has been shown in multiple studies to have a significant influence on behavioral change (Strecher *et al*, 1986; Clark and Zim-

merman, 1990; Bandura, 1997; Aljasem *et al*, 2001; Baranowski *et al*, 2002). Few studies have related self-efficacy with SM in China. Few studies directly examined differences in these 4 SM behaviors and self-efficacy.

To determinate which psychosocial factors (knowledge, attitude, self-efficacy and social support) affected these 4 SM practices (adherence medication, glucose monitoring, exercise, healthy diet), univariable analysis was conducted. Findings from this study show different SM practices were associated with different factors (knowledge, attitude, self-efficacy and social support). Glucose monitoring was influenced mainly by perception of social support (p=0.006), indicating that performance of glucose monitoring needs support from community health workers with skills training, the patient's family and social medical insurance. Our study subjects were limited by insufficient health insurance aid and monitoring skill training by health workers in the community. This result is different from a study by Gallant (2003), which showed the relationship between support and diet and exercise may be relatively stronger, whereas the relationship between support and medication regimen adherence and glucose monitoring may be relatively weaker (Gallant, 2003). Previous studies found social support significantly predicted the 4 different diabetes SM behaviors; greater social support correlated with better diabetes SM (Levy, 1983; Kaplan and Hartwell, 1987).

Adherence to the medication regimen was affected by attitude toward SM (p<0.001); a more positive attitudes toward diabetes SM was associated with better adherence to the medication regimen. Swift *et al* (1995) found a patient's physical activity and diet were significantly influenced by attitude, but adherence to the medication regimen was not affected. Evidence indicates influencing attitudes of individuals with diabetes can positively affect self-management outcomes (Lockington *et al*, 1989; Greene *et al*, 1991). Very little Chinese literature evaluated attitude and diabetes SM.

Exercise was influenced by knowledge of diabetes, attitudes toward SM, self-efficacy regarding SM and perception of social support. Our findings demonstrate subjects who maintained regular exercise had a greater knowledge, a more positive attitude, higher self-efficacy and greater social support. Previous studies also indicate exercise is affected by attitude (Swift *et al*, 1995) and social support (Gallant, 2003).

Surprisingly, healthy diet was not significantly related to these 4 factors. This may by because those who were selected as subjects, were mostly retired and most elderly people in China keep the Chinese traditional diet of high fiber foods, fresh vegetables, grain, fewer sweets, fat and meat. Their dietary habits depend on tradition, not the regimen prescribed by doctors or health educators.

The low knowledge and poor SM found in this study are public health concerns. It is possible to improve SM by considering sociodemographics, knowledge, attitudes, self-efficacy, and social support. An analysis of the precursors of behavior is essential if we are to understand the factors which are central to behavioral change. The research makes it clear psychosocial factors should be taken into account in community-based peer support programs. This is critical to the success of peer supported health education intervention programs for individuals with diabetes in community settings. Without an understanding of these fundamentals, it is unlikely that any education programs will have a significant impact on behavior

and improve metabolic control.

There were several limitations of this study. The first is the selection of 3 cities from 17 cities in province. Although these 3 cities represented 3 different geographic areas of the province, they had different economic conditions and sociocultural characteristics from other cities, which may not be representative of the province level. Secondly, most study subjects were recruited from the community where they had medical records on file at the Community Health Service Center; therefore, most study subjects were retired or elderly people. This cohort may not reflect the diabetic population in general.

In summary, a knowledge of diabetes and its complications is a main component of diabetes education. A healthy diet and glucose monitoring are key diabetes interventions. Community-based peer support activities should consider diabetes education, the length of disease, income, knowledge, attitudes, self-efficacy and social support.

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