The Factors Predicting Physical Activity Among Vietnamese with Type 2 Diabetes Mellitus in Hanoi, Viet Nam

Do Thi Kim Thu*, **Yuwadee Leelukkanaveera****, **Wananarat Lawang****

*Hanoi Medical University, Hanoi, Viet Nam

**Department of Community Nursing, Faculty of Nursing, Burapha University, Thailand

Abstract

This cross-sectional analytic study aimed to explore the level of physical activity, and to predict personal characteristics, perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and perceived self-efficacy on the physical activity of people with type 2 diabetes mellitus in Hanoi, Viet Nam. The study was based on the Health Belief Model[1] and the findings of a literature review. A stratified random sampling technique was used to select one district hospital in an urban area and the other district hospital in a rural area of Hanoi, Viet Nam. The data was collected from 110 participants in an urban area and 136 participants in a rural area using self-report questionnaires. Stepwise multiple regression analysis revealed that the mean score of physical activity was 2062.20 MET (Metabolic equivalent)-minutes per week (SD = 1168.45, range 0.00 – 5520.00), and it revealed that 11.4% of participants didn't have enough physical activity. It also indicated that only four variables (occupation of labor, perceived susceptibility, perceived severity, and perceived self-efficacy) were significant predictors of physical activity. These variables accounted for about 20% (R^2 = .20, $p < .05$) of the variability in physical activity. Because too few studies of these factors were conducted in type 2 diabetes mellitus in Viet Nam, further research in this field is necessary to determine if the findings of this study are consistent in this population. This study contributes scientific evidence of predictors of physical activity that can provide the basis for generating effective interventions to increase physical activity in Vietnamese people with type 2 diabetes mellitus, to control blood glucose, and to enable them to maintain their health.

Keywords: Physical Activity, Type 2 Diabetes Mellitus, Health Belief Model

Introduction

Type 2 diabetes mellitus (DM) is a significant health problem in Viet Nam, which is a developing country. The prevalence of type 2 DM in the population increased from 1.4% in 1990 to 3.8% in 2001, and 4.1% in 2002 to 5.4% in 2008. The number of Vietnamese diabetic cases will double in 2030 compared to the year 2010. It will increase from 1.65 million people in 2010 to 3.42 million people in 2030.[2] The proportion of type 2 DM in Viet Nam in 2012 was 7.4%.[3] Because of the transitions of population and lifestyle, risk factors play a significant role in type 2 diabetes mellitus. It indicates that there will continue to be an increase in the disease in the future.[4]

According to the American Diabetes Association (ADA), in order to prevent or delay complications of type 2 diabetes mellitus, people with DM should have good glycemic control with hemoglobin A1C (A1C) level 5.7% – 6.4%.[5] However, 60% of patients had bad glycemic control.[6] Another study also showed that A1C level in Vietnamese people was very high with a meanscore of 8.9 (SD ± 2), and 59% of the people were over 8.7. In addition, WHO suggested that 80%of type 2 diabetes is preventable primarily through a healthy diet and regular moderate exercise.[8] Regular physical activity can improve glycemic outcomes and the level of glycemic control.[9] Doing physical activity consistently can lower blood glucose and improve the A1C level. When A1C is lower, people may be able to take fewer diabetes pills or less insulin. Regular physical activity also reduces the risk of developing diabetes complications. However, 80% of DM patients do not have a specific exercise regimen.[6] Ha[10] indicated the following: 92.4% of type 2 diabetes mellitus patients did not obey the recommendation about physical activity (92.4%); 67.9% did not do any regimen; and only 7.6% exercised sufficiently. This means, physical activityis a gap in blood glucose control, and an important part of the diabetes management plan in Viet Nam.

There were several factors associated with physical activity in people with type 2 diabetes. Personal and environmental barriers have been associated with the failure to participate and maintain physical activity.[11, 12] Some previous studies also revealed that self-efficacy was a significant predictor about physical activity.[13,14] In addition, previous research indicated that perceived benefits and personal characteristics were predictors of physical activity.[12, 15]

The purpose of this study was to explore the level of physical activity among Vietnamese with type 2 DM, and to determine how well the personal characteristic, perceived susceptibility, perceived severity, perceived benefit, perceived barrier, and perceived self-efficacy predicted physical activity. The finding of this study can encourage type 2 DM people to engage in physical activity in order to sustain their health.

Conceptual Framework

This study is based on the Health Belief Model that is a psychological health

behavior- change model to explain and predict health-related behaviors[1]. This study used the following main constructs of personal characteristics: (1) gender, (2) age, (3) education level, (4) occupation, (5) family income; and it also used (6) perceived susceptibility to type 2 DM and complications; (7) perceived severity of type 2 DM; (8) perceived benefits of physical activity; (9) perceived barriers of physical activity; (10) perceived self-efficacy for physical activity in people with type 2 DM. Based on the literature review, these constructs were identified by a number of researchers who were significantly associated with physical activity.[11-15]

Methods

A cross-sectional analytic study was conducted in this article.

Population and sample

The population in this study were the patients with type 2 DM who visited the Outpatient Clinic Department of the General Hospital in Viet Nam. The samples were selected from the population who met the inclusion criteria as follows:1) type 2 diabetes patients who were diagnosed by the physician and had no physical restriction to do physical activity; 2) an age between 40-70 years old;3) able to read Vietnamese; and 4) willing to participate in the study.

The sample size in this study was calculated by using the Cochran's formula[16] with the standard normal value corresponding to the desired level of confidence of 1.96, and by using an estimated proportion of type 2 DM patients who did insufficient physical activity p = .20, with an error of precision d = .05. The sample size was calculated at 246 participants.

There are 29 districts in Hanoi city, and each district has only one hospital. Hospital districts were stratified into 2 strata. Thirteen hospital districts were classified into an urban area and 16 hospital districts into a rural area. Samples were drawn from a hospital district selected by random sampling in each area: Dong Da hospital districts and Gia Lam hospital districts. The sample size in each hospital was calculated based on the proportion of the total number of DM people who registered in both hospitals, that was, 110 and 136 participants were included from Dong Da hospital districts and Gia Lam hospital districts, respectively. All of the DM people who met the inclusion criteria and visited these hospitals in February 2015 were asked to participate in this study for data collection. The participants were drawn until April 2015 when the number of samples achieving sample size were calculated in each hospital.

Procedure

The researcher introduced herself to the participants, informed them about the study, and invited them to participate in the study. The researcher obtained consent forms from the participants. Data were collect via participants who filled out the questionnaires in the room which the researcher had prepared. The researcher checked for the completion of

the questionnaires, and asked participants to complete the questionnaires if they had not been completed. The researcher entered the data into a computer spreadsheet for data analysis.

Measure

The measures for this study included: (1) the personal data; (2) the perceived susceptibility to diabetes and complications scale; (3) the perceived severity of diabetes scale; (4) the physical benefits scale; (5) the physical barriers scale; (6) the physical self-efficacy scale; and (7) the version 2 of the global physical activity questionnaire (GPAQ).

The personal data consisted of the patient's gender, age, education level, occupation, family income, A1C, blood glucose level, and duration of diabetes mellitus.

The Perceived Susceptibility Scale was developed by the researcher based on a literature review. There were 10 items in this questionnaire. It included how likely they would be to develop complications; to have worsening complications; or to have shortened life expectancy. These items were measured on a five-point rating scale. The calculation of Cronbach's alpha coefficient of 30 Vietnamese people with type 2 DM who had the same characteristics as the sample of this study was .73. The content validity of this questionnaire was tested by five experts with a Content Validity Index (CVI) equal to .80.

The Perceived Severity Scale was developed by researchers based on a literature review.The questionnaire had 10 items that looked at the participants' beliefs about the severity of diabetes as a health problem and the severity of complications arising from diabetes as a health problem. These items were measured on a five-point rating scale. The calculation of Cronbach's alpha coefficient of 30 Vietnamese people with type 2 DM was .82. The content validity of this questionnaire was tested by five experts with a CVI equal to .80.

The physical benefits scale had 29 items, which used an agree/disagree scale, asking the patients about the reasons which facilitated their intention to execute physical activity. This instrument was taken fromThe Exercise Benefits-Barriers Scale developed by Pender et al.[17] It is used to evaluate the perceived benefit of physical activity among adult patients. Each item has a five-point scale ranging from 1 = Strongly Disagree, 2 = Disagree, 3 = Not Sure, 4 = Agree, and 5 = Strongly Agree. The response of each item was added up to obtain the overall perceived benefit score. The higher that the score was, then indicated the greater the perceived benefit to obtain physical activity. This instrument was tested for the validity of its construct.[17] The calculation of Cronbach's alpha coefficient of 30 Vietnamese people with type 2 DM was .94.

The physical barriers scale had 14 items, asking the agree/disagree level of patients about the reasons that limited their intention to execute physical activity. This instrument was taken fromThe Exercise Benefits-

Barriers Scale developed by Pender et al[17]. It was used to evaluate the perceived barriers to exercise among adult patients. Each item had a five-point scale ranging from 1 = Strongly Disagree, 2 = Disagree, 3 = Not Sure, 4 = Agree, and 5 = Strongly Agree. The response of items was added up to obtain the overall perceived barrier score. The higher that the score was indicated the greater the perceived barrier to obtain physical activity. The original-version questionnaire of Pender and colleagues[17] had been checked forthe construct validity, the internal consistency reliability, and the test-retest reliability. Cronbach's alpha coefficient was .87, and the Test-retest reliability was r = .77. The calculation of Cronbach's alpha coefficient of 30 Vietnamese people with type 2 DM was .93.

The perceived self-efficacy of physical activity scale was used from the instrument of Thilo Kroll and his colleague (2007). The questionnaire asked the perception of patients about the degree of confidence to perform physical activity. It consisted of 10 items; each item hada scale from 1 = Not at All True, 2 = Rarely True, 3 = Moderately True, and 4 = Always True. The response of 10 items was added up to obtain the overall confidence score, with a possible range from 0 to 40. The higherthat the score was indicated the higher perceived self-efficacy to obtain physical activity. The calculation of Cronbach's alpha coefficient of 30 Vietnamese people with type 2 DM was .88.

The GPAQ was developed byWHO for physical activity surveillance in countries[18]. It collects information on physical activity in three settings (or domains), and on sedentary behavior. It is comprised of 16 questions (P1-P16). The domains are: activity at work (P1-P6); travel to and from places (P7-P9); recreational activities (P10-P16); and sedentary behaviors[18]. Physical activity was evaluated after calculating the MET minutes spent in physical activity per week. Physical activity was divided into three levels: high level, moderate level, and low level[18]. When calculating a person's overall energy expenditure using GPAQ data, 4 MET-minutes were assigned to one minute spent in moderate activities, and 8 MET-minutes to a minute spent in vigorous activities. The moderate-level and high-level physical activity should achieve at least 600 MET-minutes per week. This original version questionnaire evaluated validity and reliability via two studies. The test-retest reliability of first study in three months was r = .53 to .83, and reliability in 10 days was r = .83 to .96.[9]

Results

Personal Description of Subjects

The sample included 246 Vietnamese people with type 2 DM. Half of them were females (50.8%). Their mean age was 56.93 years (SD = 11.48) with a range of 35 to 84 years. More than half of subjects (53.6%) had completed a general education. Retired, civil servant and casual laborers were the most common career among the sample (22%,19.9% and 16.3%, respectively). It was also revealed that most of their family (58.5%) earned less

than 4,500,000 VND per month (~7,500 Thai Baht). The subjects' mean DM duration was 4.58 years (SD = 2.85) with range from 1 to 15 years. The average of their A1C index was 7.58% (SD = 1.36) and their meanblood glucose level was 8.53 mmol/l (SD = 2.57).

Description of the Individual Belief and Physical Activity

The mean score of individual belief and physical activityis presented in table 1. In addition, the study showed that the samples' mean of physical activity was 2062.20 MET-minutes per week (SD = 1168.45, range .00 – 5520.00). The highest physical activity was at work with a mean of 1086.50 MET-minutes per week (SD = 1015.41, range .00 – 5040.00). Next was travel to and from places with a mean of 508.13 MET-minutes per week (SD = 607.88, range .00 – 4200.00), and the lowest was recreational activity with a mean of 469.19 MET-minutes per week (SD = 705.14, range .00 – 3840.00). Most of the subjects had a moderate or high level of physical activity (66.3% and 22.3%, respectively), and only 11.4% of subjects had low or insufficient level of physical activity. The mean total score of subjects about susceptibility to type 2 DM complications was 35.56 (SD = 4.81) with a range from 24 to 46 score. The sample had perceived severity of diabetes with a mean total score of 35.69 (SD = 5.71, range 16 – 46). The sample had a mean total score of perceived benefits of physical activityof 86.60 (SD = 10.99, range 58 – 115). It was also revealed that the mean score of perceived barriers of physical activity was 29.44 (SD = 6.27, range 14 – 48), and the mean score of perceived self-efficacy was 28.26 (SD = 4.15, range 16 – 40).

Table1. Mean, standard deviation, range of major variables

Variables	M	SD	Range
Perceived susceptibility	35.56	4.81	24 – 46
Perceived severity	35.69	5.71	16 - 46
Perceived benefits	86.60	10.99	58 – 115
Perceived barriers	29.44	6.27	14 – 48
Perceived self-efficacy	28.26	4.15	16 – 40
Physical activity	2062.20	1168.45	.00 – 5520.00
Subscale			
Work	1086.50	1015.41	.00 – 5040.00
Travel to and from places	508.13	607.88	.00 – 4200.00
Recreational activities	469.19	705.14	.00 – 3840.00

Predictions between Independent Variables and Physical Activity

Before conducting stepwise multiple regression analysis, an assessment of multicollinearity, normal distribution, homoscedasticity, and linear relationship was performed. The results indicated that the correlation coefficients among the independent variables ranged from -.43 to .58, with a tolerance value greater than .75, a variance inflation factor less than 10.0, and no multicollinearity. The scatterplot and histogram of the residual showed that the assumption about normality, homoscedasticity, the lack of an outliner, and linearity were met. All of the nominal and ordinal variables, such as gender, education level, occupation, and family income were transferred to dummy variables.

Stepwise multiple regression was used to examine the relationships between age, gender, education level, occupation, family income, perceived susceptibility, perceived severity, perceived benefits, perceived barriers, perceived self-efficacy, and physical activity. The results indicated that independent variables accounted for about 20% (R^2 = 0.20) of the variability in physical activity. It also showed that the occupation of labor, perceived susceptibility, perceived severity, and self-efficacy could significantly explain the physical activity (r^2 = .20, $F(4,241)$ = 15.45, $p < 0.001$). The other variables (gender, education level, occupation of officers and retired/unemployed, family income, perceived benefits, and perceived barriers) did not make statistically significant contributions to physical activity (Table 2).

Table 2. Stepwise multiple regression of variables predicting physical activity

Variables	B	SE	Beta	t	p
Constant.	653.11	650.81		1.00	.32
The self-efficacy of physical activity.	67.98	17.63	.24	3.86	<.01
The perceived susceptibility to diabetes and complications.	-67.58	14.99	-.28	4.51	<.01
The perceived severity of diabetes.	49.04	13.48	.24	3.64	<.01
Labor.	463.58	147.81	.18	3.14	<.01

Intercept = 24.25, R^2 = .20, $F(4, 241)$ = 15.45, $p < .001$

Discussion

This study aimed to explore the physical activity levels of Vietnamese with type 2 DM, and determine the predictions between the personal characteristics, the perceived susceptibility to DM and complications, the perceived severity of diabetes, the perceived benefits of physical activity, the perceived barriers of physical activity, the perceived self-efficacy and the physical activity, which is considered the first Vietnamese study in this field. This study showed that approximately 11.4% of subjects had insufficient physical activity, while 66.3% and 22.3% of the participants were considered to have moderate and high levels of physical activity, respectively. The study result also showed that most of the patients had sufficient physical activity, which they received from work, and a little from exercise. This result was different compared to other articles.[20, 21] In a study among 62 males and 134 females with type 2 DM in Thailand, the authors indicated that most of them exercised regularly at least three times a week (65.8%), and they likedto exercise by walking (67%).[21] It was also different from findings of another study about physical activity in the United Arab Emirates. This study revealed that walking for the purpose of exercise was the most popular activity with 78%.[22]

The findings of this study also indicated that the Health Belief Model, which was developed and tested in Vietnamese people with type 2 DM, accounted for 20% of the variance in physical activity. The results revealed that taken together, the perceived susceptibility, perceived severity, perceived self-efficacy, and occupation of labor in the model played an important role in predicting physical activity.

In this study, self-efficacy was the predictor of physical activity. This result can be explained because people generally do not try to do something new unless they think they can do it. If someone believes a new behavior is useful, but does not think that he or she is capable of doing it, chances are that it will not be tried.The finding is consistent with results of a previous study, for example in a study in Canada, the researcher showed that self-efficacy was associated significantly with aerobic physical activity ($\beta = 0.45$, $p < .001$), and resistance training ($\beta = 0.48$, $p < .001$) [15]. In another study, Mishalia, Omer and Heymann[23] found that the correlation between self-efficacy and physical activity was 0.67. Another study in Spain showed that participants with higher self-efficacy were more likely to adhere to exercise.[24]

The perceived susceptibility is also considered to have an association with physical activity. The results indicated those individuals who have high perceived susceptibility had low physical activity. It was the opposite with Glanz, Rimer, and Viswanath[13] when they considered that the greater the perceived susceptibility, the greater the likelihood of engaging in behaviors to decrease the risk. A possible explanation may be that when they were worried about diabetes and complications, it could be a barrier that made

them increase physical activity.[25]

The findings of this study suggested that perceived severity played an important role affecting the physical activity in type 2 DM patients. The results of the study demonstrated that the costs of living with DM are so difficult, that DM complications can be very painful and cause sufferingin the lives of DM patients, or that getting diabetes's complications can slow down daily living; thus, these things can influence positive participation in physical activity of the subjects in order to avoid such difficulties. These findings are consistent with most important previous study that show that DM patients are more likely than others to engage in behaviors to control their status.[26] For example, a study about self-care predictions about blood glucose control in Aboriginal persons with type 2 diabetes mellitus also showed that perceived severity was related to blood glucose status at base line and follow up, and predicted reduction in A1C ($\beta = .40$, $p < .05$).[26]

The occupation of labor also presented an important factor that predicts physical activity. This result showed that people who were laborers did physical activity more than people in other occupations. This was because the characteristics of their jobs contained physical activity more than other occupations.

This study showed that age, gender, educational level, perceived benefits, perceived barriers could not predict physical activity. The findings were not consistent with previous literature reviewed about personal characteristics,[15,27] perceived benefits,[14] and perceived barriers.[1,11,12] However, there have been too few studies that have been conducted about these factors in Vietnamese people with type 2 DM; so, it is premature to conclude they are not predictors of physical activity.

Implication

The Health Belief Model was conducted for the first time about physical activity among Vietnamese people with type 2 DM. The findings from this study have implications for nursing practice and research. They are of primary concern to nurses and other health professionals. This study contributes scientific evidence of the predictors of physical activity that can provide the basis for generating effective interventions to increase physical activity in Vietnamese people with type 2 DM. The recommendations of the study are: (1) The findings of this study showed that most of the type 2 DM patients had a good level of physical activity, particularly at work, so the nurses and health care providers should give the patients education about the type of physical activity that is suitable for them, like relaxing physical activity, such as walking, stretching muscles or playing sports that relieves the stress from work. (2) A training program both in the home and community setting should be conducted or appropriate intervention should be implemented to encourage the patients to have self-efficacy to do physical activity. (3) Also, a program should be implemented to help patients to realize and understand the severity and

complications of DM. (4) Lastly, in Vietnamese society, home and family are very important, and traditionally people live with their family. Therefore, increasing mutual understanding about these factors among the family members are important tasks of community nurses to improve physical activity.

References

1. Janz, Nancy K, Becker, HM. "The Health Belief Model: A Decade Later". Health education behavior.11th ed. 1984. doi:10.1177/109019818401100101
2. Shaw JE, Sicree RA, Zimmet PZ. Global estimates of the prevalence of diabetes for 2010 and 2030. Diabetes Research and Clinical Practice. 2010; 87, 4-14.
3. Lanh NV. The actual state of diabetes mellitus, pre diabetes in Khermeethnic, HauGiang province, and examine effect of intervention. Hau Giang; 2014.
4. Ministry of Health of Vietnam. Annual report. [online]. 2007. Avaiable from http://www.moh.gov.vn/legaldoc/pages/Directdocument.aspx. (Cited : August 25, 2014).
5. American Diabetes Association. Standard of medical care in diabetes. Diabetes Care; 2014
6. Binh TV, Hoan LQ. Improving the qualityof diabetes education in Vietnam – a community based approach. Diabetes Voice 2007; 52: 46-48.
7. Chuang LM, Tsai ST, Huang BY, Tai TY. The status of diabetes control in Asia--a cross-sectional survey of 24 317 patients with diabetes mellitus in 1998. Diabet Med. 2002; 19(12): 978-85.
8. WHO. The impact of chronic disease in Australia. [online]. 2009. Available from http://www.who.int/chp/chronic_disease_report/australia.pdf. (Cited : September 17, 2014)
9. American Diabetes Association. Nutrition recommendations and intervention for diabetes. [online]. 2011. Avaiable from: http://care.diabetesjournals.org/content/31/Supplement_1/S61.full. (Cited : September 19, 2014)
10. Ha BT. The diabetes sistuation in patients at General hospital in Bac Can province. (Master thesis, Thai Nguyen University of Medicine). [online]. 2009. Avaiable from: http://www.tn.edu/~asb/theses/2009/. (Cited : October 1, 2014)
11. Anna M, Petra P, Renate KM, Ulrike T, Timo H. Barriers to physical activity in older adult in Germany: a cross sectional study. International Journal of Behavioral Nutrition and Physical Activity 2011; 8(121).
12. Ashley MF, Devin MM, Michelle AR, Lawrence CK, Carol RH. Barriers to physical activity in East Harlem, New York. Journal of Obesity 2012; doi: 10.1155/2012/719140.
13. Glanz, K., Rimer, B. K., Viswanath, K. 4th ed.. Health behavior education: theory, research, and practice.San Francisco: Jossey-Bass; 2008.
14. Geoff PL, Wallid EA, John KP. Perceived exercise benefits and barriers of non-

exercising female university students in The United Kingdom. International Journal of Environmental Research and Public Health 2010; 7: 784-98.

15. Ronald CP, Linda T, Kerry SC, Nandini K, Ronald JS. Predictors of aerobic physical activity and resistance training among Canadian adults with type 2 diabetes: An application of the Protection Motivation Theory. Psychology of Sport and Exercise 2009; 10: 320-8.
16. James E, Joe W, Chadwick C. Organizational research: Determining appropriate sample size in survey research. Information Technology, Learning, and Performance Journal 2001; 19(1): 43-50.
17. Sechrist KR, Walker SN, Pender NJ. Health Promotion Model - Instruments to Measure HPM Behavioral Determinants: Exercise Benefits/Barriers Scale [EBBS] (Adult Version). University of Michigan; 1987.
18. WHO. Global physical activity questionnaire. Gevena, Switzerland: n.d. [online]. Avaiable from: http://www.who.int/chp/steps. (Cited : on September 20, 2014)
19. Herrmann SD, Heumann KJ, Der Ananian CA, Ainsworth BE. Validity and reliability of the Global Physical Activity Questionnaire. Measurement in Physical Education and Exercise Science. 2013; 17: 231-235.
20. Melissa B, Sara W, Marilyn L, Kimberly B, Rickey EC, Lottie M,Anntronet Y. Factor associated physical activity among African-American men and women. American Journal and Preventive Medicine 2006; 30(4): 340-6.
21. Navaporn C, Nualpis I. Exercise behavior and knowledge among the diabetes mellitus type 2 patients. J Med Assoc Thai 2009; 93(5).
22. Juma A, Fatma A, Hussein S, Bachar A, Hasratali P, Nicolass N. Physical activity and reported barriers to activity among type 2 diabetic patients in the United Arab Emirates. The review of diabetic studies 2009; 6(4), 271-8.
23. Mishalia M, Omer H, Heymann AD. The importance of measuring self-efficacy in patients with diabetes.Family practice 2011; 28: 82-7.
24. Forsyth LH, Goetsch VL. Perceived threat of illness and health protective behaviors in offspring of adults with non-insulin-dependent diabetes mellitus. Behavioral Medicine 199; 23(3): 112-20.
25. Adam J, & Folds L. Depression, Self-efficacy, and Adherence in Patients With Type 2 Diabetes. The Journal for Nurse Practitioner 2009;10(9): 646-52.
26. Jame AS, Hudson MA, Campbell MK. Demographic and psychosocial correlates of physical activity among African Americans. Am J Health Behav 2003; 27(31): 431.
27. Daniel M, Messer LC. Perceptions of diasease severity and barriers to sel-care predict glycemic control in Aboriginal persons with type diabetes mellitus. Chronic Dis Can 2002;23(4): 130-8.