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FACTORS INFLUENCING EATING BEHAVIOR OF PEOPLE WITH TYPE 2 DIABETES IN BHUTAN.

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ABSTRACT

This cross-sectional study explored eating behaviors among Bhutanese with type 2 diabetes and examined the predicted relationships between perceived self-efficacy, social support, perceived barriers, and eating behavior. Pender's Health Promotion Model provided a conceptual framework for this study. A simple random sampling technique was used to recruit 82 type 2 diabetes (T2D) individuals from the Diabetic Outpatient-clinic at Jigme Dorji Wangchuck National Referral hospital, Thimphu, Bhutan. Data collected using self-report questionnaires comprising demographic questionnaire, eating behavior questionnaire, perceived self-efficacy questionnaire, and perceived barriers questionnaire. Data were analyzed using descriptive statistics and Stepwise multiple regression analysis.

The results revealed that participants' eating behavior was at a moderate level. Pearson correlation coefficients indicated significant correlation between eating behavior and perceived self-efficacy (r = 0.720, p < 0.001), social support (r = 0.54, p < 0.05), and perceived barrier (r = 0.24, p < 0.001). Stepwise multiple regressions revealed that only perceived self-efficacy significantly predicted eating behavior (β = 0.57, p < 0.001) and explained total variance of 51.3% (F 1, 80 = 86.22, p < 0.001, adjusted R^2 = 0.513).The results provide important information to use perceived self-efficacy to design effective nursing intervention in order to promote blood sugar control and improve quality of life among people with T2D.

Keywords: Type 2 diabetes, eating behavior, and influencing factors.

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INTRODUCTION

Type 2 diabetes (T2D) is a non-communicable chronic illness affecting millions of people around the world. More than 180 million people have diabetes, and these numbers are expected to double to 366 million, with more than 150 million in Asia (Cockram, 2000). Estimates are that by 2030 both Type 1 and T2D cases will increase by 70% in developed countries and 42% in developing countries. According to the World Health Organization (WHO, 2006), diabetes mellitus causes 3.2 million deaths in 2006. Similarly, in Bhutan, the incidence of T2D increased 22.4 % annually from 2007 to 2011 (Anonymous_Annual Health Bulletin, 2012). The World Diabetes Foundation (WDF) estimated that in 2004 there were 10,000 to 20,000 Type 2 diabetics residing in Bhutan (Meyer, 2004). The Royal Government of Bhutan identified diabetes care as a key area of development in its Ninth Five Year Plan 2002-2007 (Anonymous_Annual Health Bulletin, 2009).

The major problem with T2D is uncontrolled blood sugar, which leads to devastating consequences. Ten to 24 % of T2D people develop nephropathy. Thirty percent of these progress to overt nephropathy; approximately 20 % develop End Stage Renal Disease (Augustine and Donald, 2008), 42% develop hypertension, 30% develop retinopathy, 2.6% develop paralysis, and 1.7% develop myocardial problems (WHO, 2008). T2D also affects psychosocial well-being. Surwit et al. (2002) found that people with diabetes had more symptoms of depression, while Coclami and Cross (2011) also found that people had poorer blood sugar control due to diabetic-related mental stress.

The critical component of blood glucose control among those with T2D is lifelong lifestyle modification, including exercise and dietary modification (WHO, 2006). Diet control is an important factor in blood glucose regulations and prevention of complications associated with T2D. Healthy eating behavior involves adoption of consuming whole grains, green vegetables, fruits, and decrease in saturated fat, trans fat, cholesterol, and processed sugars (Povey and Clark-Carter, 2007).

Despite the benefits, Xavier (2009) found that adherence to healthy eating practices have declined from 15 to 8% among diabetic patients in America. Yannakoulia (2006) also found that deviations in meal times, particularly skipping breakfast and eating unhealthy snacks, were associated with poor diabetes control among people with T2D. Glycemic control was negatively related to eating out, and to choosing high-fat menus. In addition, T2 diabetics typically knew they needed to change their eating behaviors, but they found recommendations confusing and difficult to maintain (Gazmararian et al., 2009).

Three factors influencing people's eating behaviors have been identified from previous studies, i.e.,perceived self-efficacy, perceived barriers, and social support from family.

Self-efficacy. Wen et al. (2004) found that the perceived self-efficacy explained significant variance in adherence to dietary plan, while Sarkar et al. (2006) found that an increasing in perceived self-efficacy among people with T2D was positively associated with diet self-care. Xu et al. (2008) found that the perceived self-efficacy determined healthy food choices.

Perceived barriers. Nagelkerk et al. (2005) found that the study participants' understanding of perceived barriers to healthy eating resulted in positive changes. Those underestimating or not identifying barriers to healthy eating behavior were adversely affected adherence to dietary regimens (Ajasem et al., 2010). Time and effort for food preparation and eating out are the barriers most strongly associated with low fruit and vegetable intake (Anonymous_American Dietetic Association, 2008). Other perceived barriers included non-availability, non-accessibility and non-acceptability of recommended foods (Maxwell et al., 2010), which also contribute to non-adherence to healthy eating (Albarran et al., 2006).

Social support plays an important role in the management of diabetes. Family members influence an individual's eating behavior, palatability of foods and meal timing (Pliner and Mann 2004). Social support from family of those with T2D was found to encourage participants' adherence to diet and

assisted in maintaining healthy eating behaviors such as eating healthy food as per regimen and enhanced knowledge about self-care behaviors (Carranza and Le Baron, 2004; Miller and Davis, 2005; Choi, 2009; Kadirvelu et al., 2012).

Initiatives to control blood sugar among people with T2D in Bhutan must consider the country's dietary patterns. Traditional Bhutanese diets are spicy and rich in fat and rice is the major staple. Sasaki (2011) confirmed that Bhutanese consumed considerable rice, which was rich in carbohydrates, and all Bhutanese delicacies contained high amounts of sugar and fats. Typically, people eat a huge portion of rice serve with a small cup of curry that prepares using only chilies and little or no vegetables. This is the widely eaten style of breakfast in Bhutan. Another popular dish is desi, which is made of rice, butter, sugar, saffron and golden raisins. Dzed also found that the Bhutanese diet contains high fats and more carbohydrates (Dietician, Jigme Dorji Wangchuck National Referral Hospital (JDWNRH), Thimphu, Bhutan, "personal communications"). Furthermore, many Bhutanese favor overweight figures as a sign of prosperity and wealth.

Bhutan is experiencing a consistent rise in the prevalence of uncontrolled blood sugar and related complications. T2D is likely contributing to this problem. Traditional Bhutanese eating behavior is becoming a concern. The purpose of the study described here was to understand better the factors related to the eating behaviors of Bhutanese with T2D, specifically perceived self-efficacy, perceived barriers to healthy eating, and social support. The results will be used to design effective nursing interventions in the future to promote control of blood sugar of those with T2D.

METHODOLOGY

A predictive cross-sectional design was used to study eating behaviors among Bhutanese with T2D and to examine the relationship between perceived self-efficacy, social support, perceived barriers and eating behavior. The Institutional Review Board (IRB) of the Faculty of Nursing, Burapha University, Thailand and the Research Ethic Board of Bhutan approved the study.

Participants were drawn from people with diabetes who come for their routine monthly follow-up at the Diabetic Outpatient Clinic of JDWNRH, Thimphu, Bhutan. Criteria for participation in the study were those aged between 20 to 65 years, diagnosed with T2D at least one month, able to comprehend English language, and consent to participate in the study. A sample of 82 participants was recruited during February and March 2013. Eligible participants were approached and informed about purposes, procedures, benefits of the study, and protection of human subjects. Participants had the right to refuse participation without penalty. A participant's confidentiality and anonymity were assured.

Each participant completed a set of five questionnaires, described below.

Part 1: Demographic data questionnaire (DDQ). The DDQ was used to collect demographic data, educational level, occupation, total monthly income, duration of diabetes, whether or not on diabetic medication and last fasting blood sugar value. Current fasting blood glucose (FBG) results were collected from each patient's medical records with their consent.

Part 2: Self-management diabetes behavior questionnaire (SMDBQ) developed by Primanda et al. (2011) was used to measure eating behavior.

Part 3: Eating habits confidence survey developed by Sallis et al. (1988) was used to measure perceived self-efficacy.

Part 4: Healthy eating barriers scale developed by Walker et al. (2006) was used to measure perceived barriers.

Part 5: Diabetic social support questionnaire (DSSQ- family) developed by La Greca and Bearman (2002) was used to measure social support.

Data analysis

Descriptive statistic was used to describe the demographic characteristics and participant's eating behaviors. Internal consistency for the scales was examined using Cronbach's alpha, with results of 0.83 for SMDBQ, 0.83 for eating habits confidence

scale, 0.95 for the DSSQ-family and 0.74 for the healthy eating barrier scale. In stepwise regression, predictor variables were entered into the regression equation. Statistical significance level was assumed when $p < 0.05$.

RESULTS

The characteristics of the sample

The results showed a nearly equal distribution of participants between male (47.6%) and female (52.4 %). Ages were ranged from 27 to 64 years. The majority of the participants was in the age group 45 – 54 years ($\bar{x}$ =49.8, SD= 8.31), and married (85.4%). More than half of participants (57.3%) were working in the government service and 68.3% earned monthly income between Ngultrum 10,000 – 20,000 (approximately 180 - 360 US Dollar) with the mean values were $\bar{x}$ = 18,150, and SD = 5,778.18. About half of the respondents completed high school and nearly 20% had attained university education. The average duration of diabetes was 4.3 years ($\bar{x}$ = 4.37; SD = 3.71). About 68.3% had intermediate glycemic control (FBG = 154 – 211 mg/dl) while 14% had poor glycemic control (FBG ≤ 211). The majority (98.8%) of the participants were on diabetic medication to control their blood sugar (see Table 1).

Table 1. Showing sample characteristics (n= 82).

Characteristics	Number (n)	Percentage (%)
Gender		
Male	39	47.6
Female	43	52.4
Age $\bar{x}$ = 49.8, SD = 8.317	Min = 27, Max = 64	
25 – 34	6	7.3
35 – 44	13	15.9
45 – 54	44	53.7
55 – 65	19	23.2
Marital status		
Married	70	85.4
Single	5	6.1
Divorced	6	7.3
Widow	1	1.2
Occupation		
Government service	47	57.3
Private business	26	31.7
Retiree	9	11.0
Educational level		
Junior high school	32	39.0
High school	35	42.7
Graduate/university	15	18.3
Income (Ngultrum)		
$\bar{x}$ =18,150; SD = 5,778.18	Min = 9,000	Max = 37,000
< 10,000	2	2.4
10,000 – 20,000	56	68.3
≥ 20,001 to 300,000	20	24.4
>300,000	4	4.9
Duration of Diabetes: $\bar{x}$ 4.37; SD: 3.71,	Min = 5 m, Max = 16 y	
< 1 year	7	8.5
1 – 5 years	46	56.1
> 5years	29	35.4
Medication		
Yes	81	98.8
No	1	1.2
Fasting blood sugar $\bar{x}$ = 175, SD: 39.83,	Min = 91. Max = 285	
Controlled (≤ 153 mg/dl))	14	17.1
Intermediate (154 - 211mg/dl))	56	68.3
Poorly controlled (≥ 212 mg/dl)	12	14.6
Perceived self-efficacy Social support Perceived barrier		

The level of eating behavior had the values of $\bar{x}$ =78.93, and SD = 11.69. Participants had moderate levels of perceived self-efficacy with $\bar{x}$ = 62.99, and SD = 14.65, and moderate levels of social support with $\bar{x}$ = 57.60, and SD = 17.84, while perceived barriers were at low level with the values of $\bar{x}$ = 17.96, and SD = 3.43 (see Table 2).

Table 2. Showing mean, standard deviation and level of eating behavior, perceived self- efficacy, social support and barriers (n= 82).

Variables	Possible scores	Actual score	Mean	SD
Eating behavior	33-132	55-114	78.93	11.69
Perceived self-efficacy	20-100	32-98	62.99	14.65
Social support	20-100	16-92	57.60	17.84
Perceived barriers	9-36	12-29	17.96	3.43

Factors predicting eating behavior

Stepwise multiple regression analysis was conducted to predict eating behavior among people with type 2 diabetes in Bhutan. Assumption of regression analysis was tested including normality of dependent and independent variables, multicolinearity, linearity, autocorrelation and homoscedasticity. All assumptions were met.

Table 3. Showing the correlation between predictors and eating behavior (n = 82).

	Perceived self-efficacy	Social support	Perceived barrier
Perceived self-efficacy			
Social support	0.63***		
Perceived barrier	0.17*	0.28**	
Eating behavior	0.72***	0.54***	0.24*

*$p < 0.05$, **$p < 0.01$, *** $p < 0.001$

Results from the correlation matrix (see Table 3) showed that perceived self-efficacy, social support, and perceived barriers were significantly correlated to eating behavior (r = 0.720, $p < 0.001$; r = 0.54, $p < 0.001$; and r = 0.24, p < 0.05, respectively). However, the results revealed that only perceived self-efficacy predicted eating behavior (β = 0.57, p < 0.001), whereas social support (β = 0.14, p > 0.05) and perceived barrier (β = 0.12, p > 0.05) were not significantly predictive of eating behavior. The final model with perceived self-efficacy explained was 51.3% of the variance where the values of $R^2 = 0.519$, adjusted $R^2 = 0.513$, and F [1, 80] = 86.22 were at the level of p < 0.001, as shown in Table 4.

Table 4. Showing summary of stepwise regression analysis for variables predicting eating behavior (n = 82).

Variables	Unstandardized β	Standardized β	t	R^2	Adjusted R^2	F
Constant	42.729	-	10.68***	-	-	-
Perceived self-efficacy	0.57	0.72	9.28***	0.519	0.513	86.22***

*** p < 0.001.

Predictor: perceived self-efficacy.

Dependent variable: eating behavior.

DISSCUSION

Eating behavior of T2D Bhutanese people

In the current study, the majority of Bhutanese people with T2D had moderate level of eating behavior. There are several reasons that might contribute to moderate level of eating behavior among the Bhutanese with T2D. The moderate level of participants' eating behavior fit with the description of their daily food consumption, whereby most of them were unable to meet the appropriate daily amount of calorie intake. Moreover, findings in the current study showed more than 14% of the participants had poor glycemic control (FBG ≥ 211) while 56.1% had intermediate glycemic control (FBG = 154-211mg/dl). Davis and Wylie-Rosett (2008) pointed out that monitoring the total amount of carbohydrate-consumed daily is important because carbohydrate is the nutrient that has the greatest impact on blood glucose. Hu et al. (2001) stated that higher calorie load and trans fat are associated with increased diabetes risk.

Essentially, calorie intake for T2D individuals should be based on their body needs. Unfortunately, most of the participants were not well acquainted with the calculation of amount of calories of their meals. Or they were aware and tried to reduce calorie intake by consuming food substitute with lower carbohydrate content foods such as rice snacks (locally known as zaw), rotis made from barley, wheat flour. Still their blood glucose level was not well controlled.

Participants followed food selection and arranging meal plan at a moderate level. Generally, people living with T2D typically sustained healthy eating behavior. However, in spite of increased awareness about the importance of healthy eating, the opposite occurred in practice among people with chronic T2D (Yannakoulia, 2006). The dietary management for Bhutanese T2D individuals was as recommended by ADA. Proportion of carbohydrates is based on the energy requirement of the patient, dividing it into grams of carbohydrate. The gram of carbohydrate is further divided by Carb serving (15 g of carbohydrate = 1 Carb serving), and thus the total number of Carb choices for the day is determined. The ADA recommendation for fat is 30% and 10 to 20% protein for people with type 2 diabetes. The participants are supposedly able to understand these recommendations. Yet they likely failed to adhere to the recommendations. Some possible contributing factors may be less choice of healthy food due to inadequate supply of healthy and fresh food commodities. Therefore, accessibility and choice of food could be one factor prohibiting selection of healthy food among the participants. It was reported that two thirds of the population (66.6%) did not eat enough fruits and vegetables due to lack of supply and transportation difficulties (Anonymous_Bhutan at a Glance, 2007). Consistently, previous study found that inadequate diet due to lack of access to healthy food was a commonly identified problem of diabetes dietary management (Wen et al., 2004).

Another possible contributing factor for participants not having met recommended eating practices was most likely from rice being the staple diet. Findings revealed that participants had three meals daily. A study by Sasaki (2011) found as a part of the Bhutanese culture all three daily meals consisted of huge portion of rice. It was evident that cultural backgrounds served as important influences on dietary behavior (Pender et al., 2006). Other studies also affirmed the influence of cultural background on dietary behaviors: reducing the consumption of rice was difficult for patients because rice is a main food as part of their culture (Sowattanangoon et al., 2009); and food was a source of nourishment for the body, a sign of warmth, acceptance, friendship, and signifying one's cultural background (Puoane et al., 2006). In addition, cultural practices that offer food and gifts as social norm restrict adherence to dietary regimens which most likely resulted in unhealthy eating behaviors.

The other possible factor that might contribute to the moderate level of dietary behavior is monthly income. This study revealed that the majority of participants had personal income between 10,000 – 20,000 Ngultrum (180- 360 US Dollar). This amount may be considered as minimum with only one person earning in a typical family of 4 or 5 people considering

rising inflation rate in the country based on the statement in the national newspaper of Bhutan, Kuensel online (July, 2012), stating prices of both consumable and non-consumable commodities and services increased by a record 13.53% from a year ago, as measured by Bhutan National Statistical Bureau's consumer price index. Adequate income is important to ensure that people had the luxury to buy healthier foods rather than high calorie and high carbohydrate foods. In addition, the majority of moderate to low income adults with T2D had difficulty in resisting the temptation to eat unhealthy food, and felt deprived of desired foods as healthy food being expensive (Marcy et al., 2011).

Predictors of eating behavior among people with type 2 diabetes in Bhutan

The findings showed positive correlation among perceived self-efficacy, social support and perceived barrier. These associations can be explained by Pender's HPM (Pender et al, 2006) which suggests that perceived self-efficacy directly influences a person to engage in health promoting behavior and increases the likelihood of commitment to action and actual performance of the behavior. This finding was congruent with many previous studies: high levels of perceived self-efficacy was related to both dietary adherence and glycaemic control (Ajasem et al., 2010; Wu et al., 2006); perceived barrier was mostly associated with food choices and adherence to dietary regimens (Donini et al., 2005; Maxwell et al., 2010); and high levels of support from family was related with better long-term dietary management, and glucose control while lack of social support, particularly from family, is associated with failure of adherence to dietary regime (Carranza and Le Baron, 2004; Kadirvelu et al., 2012; Rees et al., 2010). Similarly, Bean et al. (2007) asserted that T2D patients with higher perceived self-efficacy perceived minimal barriers and were more likely to engage in health promoting behaviors. Therefore, it is clear that healthy eating behavior develops when T2D perceive high self-efficacy, perceive minimal barriers and receive adequate support.

The present study revealed only perceived self-efficacy explained 51.3% of total variance. Findings from this study support one of the basic tenets of the HPM that perceived self-efficacy is a behavioral specific cognition and influences a commitment to engage in health promoting behaviors as well as directly promotes greater participation in health promoting behaviors (Pender et al., 2006). People with T2D with high perceived self-efficacy are more likely to adopt healthy eating behaviors. The results showed participants had highest items mean score of being able to stick to low sugar and low fat food when there is no one to watch them, add less sugar in meals and eating unbuttered and less sweet snacks. These insights provide essential information for designing effective nursing intervention on reinforcing T2D peoples' confidence and motivation to adhere to healthy eating behavior. The finding was consistent with many previous studies: Ajasem et al. (2010) found greater perceived self-efficacy predicted closer adherence to ideal dietary behavior and accounted for significant variance; and perceived self-efficacy was a determinant of eating behaviors among adult people with T2DM (Wu et al., 2006).

Surprisingly, in this study perceived barrier was not significant predictor of eating behavior. However, results revealed highest item means scores indicative of participants' perceived barriers including healthy eating limiting food choice, healthy eating means having to give up favorite foods, and healthy eating is unappetizing. This is congruent with study by Maxwell et al. (2010) that perceived barriers to carrying healthy behaviors were difficulty to choose healthy food over favorite food, while Nagelkerk et al. (2005) found perceived barriers was associated worst with diet including unappetizing and inconvenience. On the other hand, participants perceived minimal barriers. Correlation revealed the least significant relation between perceived barrier and eating behavior. These findings might lead to why perceived barriers did not predict eating behavior in this study. Furthermore, perceived barriers and the magnitude of their associations with inadequate dietary health behavior can depend on the population studied. In this study, participants were in between the age group 45-55 years which represented adult

people who might have perceived minimal barriers compared to elderly people. Similarly, a study by Wen et al. (2004) found that adults perceived less barriers compared to elderly Hispanics with T2D.

Social support from family did not predict eating behavior in this study. However, Carranza and Le Baron (2004) asserted that family support influenced eating behavior among Mexicans; Wen et al. (2004) concluded that high level of family support enhanced adherence to healthy dietary regimen. Family can be primary sources of social support, as well as provide personal hands-on care during the times of illness. Participants in this study had some items with highest mean scores including family encouraging eating the right food, eating meals together and reminding not to eat unhealthy food. This was similar with previous research by Epple et al. (2003) which found family support was associated with improved metabolic outcomes. However, some of the items mean score were low indicating minimal support from family in regards to reminding about portion control, doing the grocery shopping, and choosing restaurants. It is a tradition for Bhutanese people to live in joint family where each individual member has his or her responsibilities by virtue of the norms and culture to care for each other within the family. Family support could be taken for granted as a family norm. Furthermore, majority of the participant in this study were either private or Government employees, which demanded more time away from home, thus unable to avail adequate family support. Furthermore, majority of participants represented adult people unlike elderly people who generally required and perceived more social support from family to carry out healthy eating practice more than the younger adults with T2D (Wen et al., 2004; Epple, 2003; La Greca and Bearman, 2002).

The findings of the study established Bhutanese with T2D practiced moderate level of eating behavior. The results indicated significant relationship between perceived self-efficacy, perceived barriers, and social support from family to eating behavior among Bhutanese with T2D. Only perceived self-efficacy explained appreciable amount of variance in eating behavior. Therefore, finding of the present study was consistent with other researches and HPM, whereby the validity of predictor of healthy eating behavior partially proved the study hypothesis.

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