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A Path Analysis of Mental Health among Thai Elderly with Diabetes Mellitus

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ABSTRACT

The study objectives are to verify a path analysis of mental health among Thai elderly with diabetes mellitus. The sampling method used is stratified random sampling. The sample size comprises 2,000 Thai elderly persons over 60 years old with diabetes mellitus. The variables are divided into individual (food, exercise, BMI and drugs), psychological (illness perception) and social factors (family support). Data are analysed using path analysis. The total variables described mental health change by 64.5%. It was found that exercise, illness perception, food and drugs as variables had a direct influence on mental health with standardised regression weights of 0.732, 0.347, 0.243 and 0.050, respectively (p-value<0.01). The exercise variable had a direct effect on mental health the most. The benefits of this study include providing recommendations to guide future mental health policy and to reduce the cost of health maintenance in Thailand.

Keywords: Path analysis, mental health, Thai elderly, Diabetes Mellitus

INTRODUCTION

Diabetes mellitus (DM) has become a Non-Communicable Disease (NCD) today that is also an important health issue globally. It has a severe effect worldwide, and there is a rising incidence and prevalence of diabetes mellitus. The Bureau of Policy and Strategy, Ministry of Public Health, Thailand found that diabetes mellitus killed an average of 19 patients per day in 2009. The number of Thai people with diabetes mellitus is indeed increasing (4.02 times) and the number facing the problem is also rising (6.9%) (Ministry of Public Health, 2009). The Thai diabetes database in 2012 found that patients with compliable diabetes was 17.51% (18,943.581) of the Thai population of diabetes patients over 35 years old (Ministry of Public Health, 2011). The Bureau of Epidemiology, Thailand in 2010 reported that new diabetes patients numbered 176,685 with a morbidity rate of

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277.36 per 100,000 persons. The ratio of new cases of male to female patients was 1:1.79. Thai elderly people over 60 years old number the highest among diabetes patients in Thailand (79,023 cases). The morbidity rate was 1,060.46 per 100,000 people (Thonghong et al., 2012).

Diabetes mellitus is a cause of death among the elderly (Aekplakorn et al., 2003; Nanthamongkolchai, 2009) and leads to complications without control (Vihayanrat, 2003; Gupta et al., 2007). Diabetes can be prevented with exercise, diet and regular medicine taking (Nanthamongkolchai, 2009; Nanthamongkolchai et al., 2009; American Diabetes Association, 2010; Tripeud et al., 2010). A report found that 3% of diabetes patients who control plasma glucose level by themselves but this figure is very low. In addition, the survey data of the National Statistical Office in 2010 found that only 13% of Thai elderly persons exercised; lack of exercise is an additional factor in diabetes incidence (National Statistical Office, 2011).

The number of Thai elderly persons is increasing rapidly. The number is estimated to increase to 20% of the Thai population in 2025. The elderly face physical and mental health challenges (Chamratrithirong et al., 2010). Illness perception and family support are factors that influence mental health among the elderly (Choorat et al., 2012). Several researchers have found that factors influencing the mental health of the elderly were not linked to mental health among Thai elderly persons with diabetes mellitus by path analysis (George , 2010; Malathum et al., 2010; Tuntichaivanit et al., 2010; Choorat et al., 2012; Gray & Thongcharoenchupong, 2012; Suwanmanee et al., 2012). Some researchers studied only the relationship between patients and family and friend support, social activity and participation, and rising self-esteem among the elderly in general (Malathum et al., 2009; Nanthamongkolchai et al., 2011), and did not include causal relationship between diabetes and food, exercise, drugs, Body Mass Index (BMI), family support and illness perception. They related their findings to individual, psychological and social factors relevant to holistic health care, especially the effect on mental health among the diabetic elderly. In addition, a Thai health report on four regions in 2006 found that the Thai population were mainly depressed and anxious. Their mental health scores were the lowest when compared with other populations (National Statistical Office, Department of Mental Health Institute for Population and Social Research Mahidol University & Department of Health Promotion Foundation, 2009; Suwannoppakao & Gray, 2011).

AIM

The aim of this research was (i) to study the direct and indirect influence of path analysis among Thai elderly persons with diabetes mellitus, (ii) to examine the relationship between each variable (e.g. food, exercise, BMI, drugs, illness perception and family support) and the mental health of Thai elderly persons with diabetes mellitus.

DATA AND METHOD

Sample

This cross-sectional study was conducted among Thai elderly persons with diabetes mellitus in the central region of Thailand. The sampling method was the stratified random sampling for a quantitative study. It involved the division of the population into smaller groups. The first

stratum was region; there are five regions in Thailand. From these five areas, 2,000 Thai elderly persons with diabetes mellitus were randomly selected from the central part of Thailand. The second stratum was province. The central region of Thailand is divided into two provinces. One thousand participants were selected from each province (1,000 cases/province).

Variables and Measurement

Data consisted of individuals, causal factors (e.g. food, exercise, drugs, body mass index, illness perception, family support) and effect factors (e.g. mental health). Illness perception is the reflex result of emotions and the thinking process. It consists of consequences, timeline, personal control, treatment control, identity, coherence, emotional representation, illness concern and causal items using BIPQ (Broadbent et. al., 2006). Family support is a social factor measuring satisfaction from the five dimensions of family support (adaptation, resolve, growth, affection and partnership) using the family APGAR (Smilkstein et al., 1982). The Thai mental health indicator (THMHI-15) (Mongkol et al., 2009) was from the Department of Mental Health, Ministry of Public health, Thailand to determine a path analysis to measure the mental health variable. A questionnaire was administered. It was divided into five parts, namely:

(i) General individual data consisted of province, region, sex (coded as 1=male, 2=female), education (coded as 1=primary school, 2=secondary school, 3=bachelor's degree, 4=master's degree, 5=doctoral degree) and BMI was calculated as weigh (kg)/height (m^2). Average BMI is below 18 (thin), 18-22 (normal), 23-30 (slightly fat) and above 30 (obese)

(ii) A path analysis of mental health measurement level uses an interval scale. For this research, it was divided into three domains (e.g. food, exercise and drugs). The food scale consisted of four items (e.g. 'You eat a lot of food during every meal'; 'You usually have dessert'; 'You eat rice three times a day and have three servings per meal'; 'You like to drink Coca Cola, tea or coffee'). The exercise and medicine scales consisted of two items (e.g. 'You exercise 30 minutes/3 days/week'; 'You do yoga, walk or run 30 minutes-1 hour every day') and four items (e.g. 'You took medicine on time, regularly, frequently and periodically'), respectively. Each item was rated on a 4-point scale ranging from 1 (none) to 4 (the most)

(iii) Each item of the BIPQ assessed one dimension of illness perception: consequence, timeline, personal control, treatment control, identity, coherence scores, emotional representation and causal items. This reflects a combination of emotional and cognitive representations. In some circumstances, it may be possible to compute an overall score, which represents the degree to which the illness is perceived as threatening or benign. The internal consistency of this score will depend on the illness studied and it is recommended that this is checked. To compute the score, reverse and add the score items. A higher score reflects a more threatening view of the illness.

(iv) Family support was measured by The Family APGAR questionnaire. Its measurement is by interval scale. Its scores are low, moderate and high family support (coded as 1=0-3 scores, 2=4-6 scores, 3=7-10 scores), respectively.

(v) A major issue of THMHI-15 is to check how mental health among participants compares to the general population. In this study, the mental health scores of the participants were poor,

normal and good (below 43, 44-50, and 51-60 scores), respectively. The Cronbach's alpha for food, exercise, drugs, illness perception, family support and mental health scales were 0.75, 0.78, 0.80 and 0.82 and 0.83, respectively. The researcher created additional questions, and used a standard measurement for the reviewer's consideration. The questionnaire was sent to the Human Ethics Committee for acceptance from Mahidol University, Thailand (COA.No.2014/060.1003). After that, the suggested changes were made. The study was carried out under the Thai Clinical Trial Register code TCTR20141124001 from Thailand.

Data analysis

General data were analysed using SPSS. The total direct and indirect relationships were verified by path analysis.

RESULTS

Two thousand Thai elderly persons with diabetes mellitus (100%) were divided into female and male groups, They were located in Nonthaburi and Nakhon Pathom province (each 1,000 cases/group/province). Most (800) had education up to Bachelor's degree level (40%). The majority were aged between 71 and 75 years old (600 cases, 30%). The BMI readings classified most of them as being obese (1,026 cases, 51.3%) (Table 1).

Table 1
Number and percentage among Thai elderly persons with Diabetes Mellitus (N=2,000)

Data		Number	Percent
Province	: Nonthaburi	1,000	50.00
	: Nakhon Pathom	1,000	50.00
Age (year)	: 61-65	500	25.00
	: 66-70	500	25.00
	: 71-75	600	30.00
	: 76-80	400	20.00
Sex	: Female	1,000	50.00
	: Male	1,000	50.00
Education	: Primary school	200	10.00
	: Secondary school	300	15.00
	: Diploma	600	30.00
	: Bachelor's degree	800	40.00
	: Master's degree	100	5.00
	: Doctoral degree	0	0
Body Mass Index; BMI			
	: thin	166	8.30
	: normal	250	12.50
	: a little fat	558	27.90
	: obesity	1,026	51.30

The mean and standard deviation for the BMI, exercise, medicine, food, illness perception, family support and mental health variables among the Thai elderly with diabetes mellitus were found to be 3.222 ± 0.959, 2.050 ± 0.864, 2.075 ± 0.754, 2.587 ± 0.693, 5.029 ± 3.141, 1.987 ± 0.715 and 1.802 ± 0.784, respectively. Exercise, medicine, food, illness perception, family support and mental health variables showed a positive skewedness. Their kurtosis was -0.688, 0.341, 0.546, -1.103, -1.048 and -1.292, respectively. The BMI variable showed a negative skewedness (-1.020) and kurtosis (-0.059) (Table 2). The results of the Pearson correlation analysis confirmed the significance of all these relationships at the $p<0.01$ level of the two-tailed *t*-test.

Table 2
Statistic data among Thai elderly persons with Diabetes Mellitus (N=2,000)

Variable	Mean	Minimum	Maximum	S.D.	Skewedness	Kurtosis
BMI	3.222 (slightly fat)	1 (thin)	4 (obese)	0.959	-1.020	-0.059
Exercise	2.050 (less)	1 (none)	4 (most)	0.864	0.368	-0.688
Drugs	2.075 (less)	1 (none)	4 (most)	0.754	0.574	0.341
Illness perception	5.029 (moderate)	1 (none)	10 (most)	3.141	0.006	-1.103
Family support	1.987 (almost moderate)	1 (low)	3 (high)	0.715	0.018	-1.048
Mental health	1.802 (almost normal)	1 (poor)	3 (good)	0.784	0.362	-1.292
Food	2.587 (almost more)	1 (none)	4 (most)	0.693	0.205	0.546

This research estimated a maximum likelihood path analysis using M-plus to find the path analysis relationship. It focussed on the accuracy of fit of the index of this research. It indicated a very close fit model (Chi-square=1.987, p-value=0.3703, CFI=1.000, TLI=1.000, RMSEA=0.000, SRMR=0.003). In addition, the total variables described mental health change by 64.5% (R square=0.645, $p<0.01$).

A path analysis of mental health among Thai elderly persons with diabetes mellitus found that the variables exercise, illness perception, food and drugs had a direct influence on mental health with standardised regression weights of 0.732, 0.347, 0.243 and 0.050 at the statistically significant level of 0.01, respectively. However, the BMI variable had no direct influence on mental health (Figure 1).

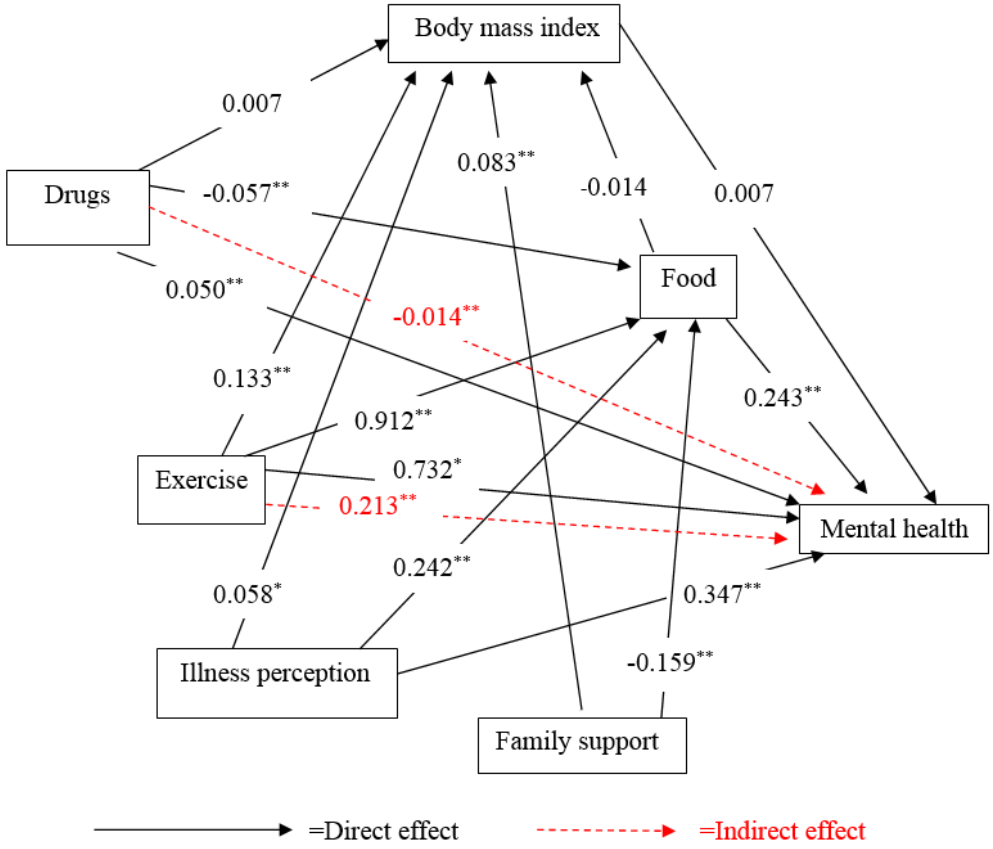
DISCUSSION

The elderly constitute a group who are experiencing physical changes that can lead to many diseases (e.g. hearing, diabetes mellitus, hypertension, cancer and inactive organs). The elderly have to cope with mental health issues (e.g. depression, hopelessness and anxiety) and are faced with loss (Chamratrithirong et al., 2009). Diabetes mellitus is a major cause of mortality among the elderly in Thailand and is an important issue for global health (American Diabetes Association, 2010).

One concept of public health and determinant of mental health has identified the factors influencing mental health problems among Thai elderly persons with diabetes mellitus. Three factors were given i.e. individual factor, psychological factor and social factors (Gray & Thongcharoenchupong, 2012; Kaewanuchit, 2013). Diabetes mellitus is a major cause of mortality among the elderly in Thailand (American Diabetes Association, 2010). Its cause is the change in individual lifestyle and behaviour. Factors influencing diabetes control are related to food, drugs/medicine and lack of exercise (Tripeud et al., 2010); and change in lifestyle and symptom management (Chaves et al., 2009; Malathum et al., 2009; Nanthamongkolchai,et al., 2009; Tuntichaivanit, et al., 2010). The commonest BMI among Thai elderly persons with diabetes mellitus in this study was obesity (51.31%) (Table 1). The mental health score was almost normal (Table 2).

Additionally, the study showed that the path analysis of mental health among the Thai elderly with diabetes mellitus has goodness-of-fit indices that are most accurate for the 2,000 cases. This indicated that the important path relationships based on public health concept and determinant of mental health among the elderly with diabetes mellitus are individual, psychological and social factors; these are factors that determine the level of mental health of a person in the field of public health. Food, exercise, BMI and drugs/medicine, which are individual variables, and illness perception, which is a psychological variable, have a direct influence on mental health among the Thai elderly with diabetes mellitus. Furthermore, this finding was also in accordance with a study (Gray & Thongcharoenchupong, 2012) that found that higher age, marital status, higher education, good economic status and good health evaluation among the Thai elderly led to good mental health. It was a determinant of mental health among the Thai elderly population. However, that research found that only 30 % of Thai elderly persons exercised regularly . By contrast, other research has described factors influencing the mental health problem among the Thai elderly. It found that the elderly, who were from the central region of Thailand, risked developing mental health problems (Choorat et al., 2012; Gray & Thongcharoenchupong, 2012). In addition, one research work found that education was a factor influencing the risk of mental health problems in Thai elderly persons (Choorat et al., 2012). Moreover, the results were also in accordance with a study (Tripeud et al., 2010) that found that factors influencing diabetes control related to food, drugs/medicine and exercise. The results indicated that these factors had a positive effect on mental health. Family support, which was a social factor, had a direct influence on mental health (Figure 1). This finding was consistent with Thai research work done in Songkhla province in 2011 (Suwanmanee et al., 2012). It found that a factor influencing mental health among the elderly was family relationship. Moreover, several studies found that high family support was related to the mental health of the elderly in all aspects (Sitthisran & Naruthum, 2009; Tuntichaivanit et al., 2010; Gray & Thongcharoenchupong, 2012). The same point showed that family relationships related to life satisfaction among female elderly persons in Hong Kong (Siu & Phillips, 2002). This was also shown by Nanthamongkolchai et al., 2009 in a study. The latter found that family relationships influenced life happiness among female Thai elderly people in Thailand. The family support variable agreed with the hypothesis and matched the finding of several other research studies (Siu & Phillips, 2002; Nanthamongkolchai et al., 2009). The results indicated that the exercise variable had a direct influence on mental health the most. It

is an individual factor that determines the level of mental health in the field of public health. Moreover, exercise, illness perception and drugs showed a positive effect on mental health. This implied that good exercise, high illness perception and drug taking led to good mental health. By contrast, BMI did not have a direct effect on mental health. However, its influence should be further examined in future studies.



** p-value<0.01 * p-value<0.05

Figure 1. A path analysis of mental health among Thai elderly persons with diabetes mellitus (N=2,000).

The major strengths of this research were as follows; (1) This sample was representative of a large population among Thai elderly persons with diabetes. The data collected was sufficient. (2) This research focussed on factors influencing mental health among Thai elderly persons with diabetes mellitus. The results were explained by path analysis in the field of public health (Thonghong et al., 2012). Furthermore, a questionnaire was used to clarify and facilitate understanding of the participants including standard measurement (e.g. The Family APGAR questionnaire and THMHI-15 using). The results of these indicated that well-validated measures were used to drive rapid changes among the elderly in society and health policy. The benefits of this study include providing recommendations to guide future mental health

policy and to reduce the cost of health maintenance in Thailand. Several limitations influenced this research. Firstly, this research studied only Thai elderly with diabetes mellitus. It did not study other groups and other NCDs (e.g. hypertension, cardiovascular disease etc.) that are also fatal among the Thai elderly population as well as world population. Some suggestions for further research are that researchers should increase important research among the Thai elderly population suffering from other NCDs, especially bio-psychosocial research. Secondly, this research studied only quantitative methods. Qualitative methods to help data support should be added. Thirdly, important statistical data used only path analysis. Further research could also use SEM analysis to analyse data more deeply.

Table 3
Direct Effect (DE), Indirect Effect (IE) and Total Effect (TE) Among Thai Elderly Persons with Diabetes Mellitus (N=2,000)

Endogenous / Exogenous variables	Endogenous variables								
	Food			BMI			Mental health		
	DE	IE	TE	DE	IE	TE	DE	IE	TE
Drugs	-0.057**	-	-0.057**	0.007	-	0.007	0.050*	-0.014**	0.036**
Exercise	0.912**	-	0.912**	0.133**	-	0.133**	0.732**	0.213**	0.945**
Illness perception	0.242**	-	0.242**	0.058*	-	0.058*	0.347**	-	0.347**
Food	-	-	-	-0.014	-	-0.014	0.243**	-	0.243**
BMI	-	-	-	-	-	-	0.007	-	0.007
Family support	-0.159**	-	-	0.083**	-	0.083**	-	-	-

*p-value <0.05
**p-value <0.01

CONCLUSION

Exogenous variables or causal variables of this research influenced mental health. They were divided into three variables (exercise, illness perception and drugs). The exercise variable (individual factor) had a direct effect on mental health the most at a statistically significant level. Every exogenous variable had a positive influence on the mental health variable. Family support, which was an exogenous variable, had a direct effect on the food and BMI variables. It had no direct effect on mental health. The food variable became a mediated variable like the BMI variable. However, the BMI variable had no direct or indirect effect on mental health, which should be studied in future. The benefits of this study include providing recommendations to guide future mental health policy and to reduce the cost of health maintenance in Thailand.

DECLARATION OF CONFLICTING INTERESTS

The author declares no conflict of interest with respect to the research, authorship and publication of this research.

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