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The Relationship Between Stress And Type 2 Diabetes Mellitus Management In Ratchaburi Province, Thailand

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ABSTRACT

Stress is one of the triggers which has also been linked to a higher risk of T2DM. Nervous strain seems to have a direct and indirect influence on the probability of becoming ill. This research aims to express the effect of stress on blood glucose parameters and to outline the effect of stress on the glycemic control of the patients in Ratchaburi province, Thailand. Data were conducted in Sub-District Health Promoting Hospital in Ratchaburi province, Thailand from January 2018 to March 2018. The participants were diabetic patients aged over 18 years old who were selected by multistage cluster random sampling. The data covered 1,890 patients. The dependent was hemoglobin A1c test (HbA1c). Research findings showed that the mean age of respondents was 57.56 years (+12.10) and the number of male respondents was higher than that of women. Most respondents (36.20%) had completed a Bachelor's degree. The majority of participants (28.35%) were employees. Regarding to duration of diabetes, the majority (28.35%) had 11-20 year. In terms of body mass index, 29.67% had body mass index between 25.0- 29.9 (overweight). Nephropathy was the most complication and comorbidity at (33.63%). Furthermore, patients were mostly taking Antihypertensive (67.80%) and ACE Inhibitor or ARB (59.00%). The majority of HbA1c level (42.74%) was lower than 7.0%. It was found that there was a positive correlation between both the fasting blood glucose, post-prandial blood glucose levels, and the stress levels.

Keywords
Stress, Type 2 of diabetes mellitus, Thailand

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Introduction

Diabetes mellitus (DM) disease is a metabolic disease characterized by an inability to maintain normal glucose homeostasis that results from an alteration of the secretion or action of insulin, the hormone responsible for the uptake of glucose in the body (Holt & Kumar, 2010). Type 2 Diabetes Mellitus (T2DM) is a well prevalent condition worldwide. T2DM usually manifests itself in adults (Wild, Roglic, Green, Sicree & King, 2004). It does not involve autoimmune destruction of β-cells but it is due to a combination of both insulin resistance and an inability of the β-cells to compensate adequately with increased insulin release (Pearce, Pereira & Davis, 2013). It is related to family predisposition, sedentary lifestyle and obesity. Insulin secretion is not
completely compromised, but just altered. Sometimes, the pancreas does not produce adequate amounts in relation to the carbohydrates ingested. Other times, the release of insulin is normal, but the body becomes resistant and does not react properly (Miller, Chen & Parker, 2011). Stress is one of the triggers and it has been linked to a higher risk of T2DM (Li, Jarczok, Loerbroks, Schöllgen & Siegrist, et al., 2013).

Nervous strain seems to have a direct and indirect influence on the probability of becoming ill. The reaction to a stressor may consist, in some cases, in the development of an unhealthy lifestyle, including the negligence of physical well-being, and a disorderly eating fashion, often using food in a compensatory or a consoling manner. These factors indirectly affect the risk of developing the disease (Aschbacher, Kornfeld, Picard, Puterman & Havel, et al., 2014). In addition, physiological changes triggered by stress may directly affect the endocrine and immune systems (Beardsley & Goldstein, 1993). There has been a growing interest in the study of psychological distress in diabetes. Some epidemiological studies have found higher prevalence rates of depression and anxiety disorders in people with diabetes (PWD) compared with the general population (Anderson, Freedland, Clouse & Lustman, 2001: Ciechanowski, Katon & Russo, 2000). Studies evaluating the relationship between depression and diabetes have yielded mixed results. For example, the prevalence of depression in patients ranges from 3.8% (Zhang, Markides & Lee, 1991) to as high as 49.5% (Leedom, Meehan, Procci & Zeidler, 1991). Some studies suggested that depression is associated with hyperglycemia in people with both type 1 and type 2 diabetes (Lustman, Anderson, Freedland, de Groot & Carney, 2000), whereas other studies did not find

any correlation at all (Trief, Grant, Elbert & Weinstock, 1998).

Aim of study

The present study aims to express the effect of stress on blood glucose parameters and to outline the effect of stress on the glycaemic control of the patients in Ratchaburi province, Thailand.

Methodology

Data was conducted in the Sub-District Health Promoting Hospital in Ratchaburi Thailand from January 2018 to March 2018. The participants were diabetic patients aged over 18 years old who were selected by multistage cluster random sampling. Ratchaburi is one of the western provinces of Thailand. The province is divided into 10 districts including 1) Mueang Ratchaburi 2) ChomBueng 3) SuanPhueng 4) DamnoenSaduak 5) Ban Pong 6) Bang Phae 7) Photharam 8) Pak Tho 9) Wat Phleng and 10) Ban Kha. The first stage was performed to select 5 districts out of 10. There were DamnoenSaduak district Meuang district, Baang pair district, Potharam district and Watphleng district. At the second stage, the total of 84 Sub-district Health Promoting Hospital (SDHPH), were selected into 42 Sub-districts Health Promoting Hospital (SDHPH). Sub-district Health Promoting Hospital has a primary role in providing integrated primary care services to individuals, family, and community (Bureau of Non-communicable Diseases, 2004). Normally, its staff consists of a director, a nurse practitioner, a public health officer, a public health technician, a dental health technician, and a Thai traditional medicine, giving health service to a population of 5,000 on average. The last stage, we selected patients with preset
qualifications. The data covered 1,890 patients
aged over 15 years, and 85 percent of participants
were successfully interviewed. The institutional research board of Boromarajonani College of Nursing, Ratchaburi (IRB-BCNR), Praboromarajchanok Institute - Ministry of Public Health has approved this study with the certificate of approval number BCNR. No. 03/2018.

Suanprung Stress Test 20 (SPST) is a standard stress measurement form which passed the concurrent validity test which is a valid and a reliable scale covering both anxiety and depression, that could be used to measure the degree of individual's response to stressful situations (Department of Mental Health, B.E., 2016). The SPST is used to explore feelings over the past 6 months, whereby the content involves the occurrence and feelings towards such occurrence. The assessment criteria is based on a scoring point with relation to stress from 1 to 5, no stress, low stress, moderate, high, and higher stress respectively. Next, total scores were summed up and compared with the criteria for assessment on the level of stress as follows: 0-24 points represent low stress, 25-42 points represent moderate stress,43-62 points represent high stress and more than 63 points represent severe stress.

The dependents were fasting blood glucose levels, post-prandial blood glucose levels and hemoglobin A1c test (HbA1c). A fasting blood sugar level less than 100 mg/dL (5.6 mmol/L) is normal. A fasting blood sugar level from 100 to 125 mg/dL (5.6 to 6.9 mmol/L) is considered pre-diabetic. If it's 126 mg/dL (7 mmol/L) or higher, it is considered diabetic (American Diabetes Association, 2008). Moreover, post-prandial blood glucose levels less than 140mg/dl (7.8mmol/l) is normal and high than 140mg/dl is considered diabetes (American Diabetes Association, 2008). Regarding hemoglobin A1c test (HbA1c), If the value. <7% indicates controlled DM; 7.0% to 7.9% means it is moderately controlled and if the value > 8% means uncontrolled. These categories are based on the Standards of medical care in diabetes from the American Diabetes Association (ADA) to classify action levels for HbA1c (American Diabetes Association, 2008).

The descriptive statistics were implemented to describe the variables by presenting the frequency distribution for sex, education, occupation, duration of diabetes, and body mass index. Moreover, the product moment correlations were applied, the result is considered statistically significant if the p-value < 0.05.

Results

Characteristics of Study Patients

Table 1 presents the characteristics of 1,890 respondents who successfully observed the data. The mean age of respondents was 57.56 years (+12.10) and the number of male respondents was higher than women. Most respondents (36.20%) had completed a Bachelor's degree. The majority of the occupation status (28.35%) was employees. Regarding the duration of diabetes, the majority (28.35%) had 11-20 year. In terms of body mass index, 29.67% of participants had 25.0-29.9 (overweight). Regarding complications and comorbidities, nephropathy was the major complication and comorbidity (33.63%) while Ischemic heart disease was the major comorbid health problem (48.3%). Furthermore, patients were mostly taking Antihypertensive (67.80%) and ACE Inhibitor or ARB (59.00%). Regarding stress level, it was found that most of patients had moderate stress (37.14%). The majority of HbA1c level (42.74%) was lower than 7.0%, fasting blood glucose levels was higher than 126 mg/dL (38.04%) and post-prandial blood glucose levels were higher than 126 mg/dL (37.93%).

Table 1. Characteristics of Study Patients (n= 1,890 patients)

Variables	Frequency	(%)
Sex		
Male	1,050	(55.58)
Female	840	(44.20)
Education		
Primary	153	(8.10)
Junior High	220	(11.65)
High school / Vocational	368	(19.49)
Diploma	330	(17.47)
Bachelor	684	(36.20)
Post graduate	120	(6.33)
Other	14	(0.76)

Variables	Frequency	(%)
Occupation		
Farmers	120	(6.33)
Government	196	(10.38)
Contractor	283	(10.25)
Employees	411	(31.77)
Student	72	(13.80)
Business	536	(18.35)
Other	172	(9.11)
Duration of diabetes		
<5year	590	(31.23)
5-10 year	500	(26.45)
11-20 year	536	(28.35)
>20 year	264	(13.97)
Body Mass Index		
<18.5, underweight	296	(15.76)
18.5-24.9, normal	217	(11.49)
25.0-29.9, overweight	561	(29.67)
30.0-34.9, obese class 1	411	(21.77)
35.0-39.9, obese class 2	82	(4.33)
>40 obese class 3	321	(16.98)
Complications and Comorbidities		
Nephropathy	636	(33.63)
Retinopathy	411	(21.75)
Neuropathy	3,255	(17.19)
Coronary artery disease	239	(12.62)
Multi-complication	239	(12.62)
Other comorbid health problems		
Hypertension	231	(12.20)
Ischemic heart disease	610	(32.30)
Stroke	913	(48.30)
Chronic obstructive pulmonary disease	215	(11.40)
Drug Class or Description		
Insulin	828	(43.80)
Oral diabetes medications		
• Biguanide	659	(34.89)
• Sulfonylurea	828	(43.81)
• Alpha-glucosidase inhibitor	54	(2.84)
• Thiazolidinedione	432	(22.87)
Antihypertensives	1,281	(67.80)
Aspirin	607	(32.10)
Any lipid-lowering drug	1,037	(54.89)
ACE Inhibitor or ARB	115	(59.00)
Diet	451	(23.87)

Table 1. (Continued)

Variables	Frequency	(%)
Stress		
Low stress	489	(25.87)
Moderate stress	702	(37.14)
High stress	699	(36.99)
HbA1c		
< 7.0%	808	(42.74)
7.0% to 7.9%	415	(21.95)
8.0% to 8.9%	299	(15.84)
9.0% to 9.9%	205	(10.86)
> 10.0%	163	(8.61)
Fasting blood glucose levels (FBS)		
Less than 100 mg/dL (Normal)	532	(28.15)
Between 100 to 125 mg/dL (Impaired fasting glucose: IFG)	639	(33.81)
Higher than 126 mg/dL (Diabetes)	719	(38.04)
Post-prandial blood glucose levels (PPBS)		
less than 140mg/dl (Normal)	528	(27.94)
Between 140 to 199 mg/dL (Impaired glucose tolerance: IGT)	645	(34.13)
Higher than 200mg/dl (Diabetes)	717	(37.93)

Stress levels and blood glucose parameters

The levels of stress were correlated with the fasting blood glucose and post-prandial blood glucose levels of the subjects (Table 2). It was found that there was a positive correlation between both the fasting blood glucose, post-prandial blood glucose and the stress levels. Thus, when there was an increase in the stress levels, fasting blood glucose and post-prandial blood glucose levels also increase concurrently. The relation between fasting blood glucose, post-prandial blood glucose, and stress levels was significant (P<0.05).

Stress levels and HbA_{1c} levels

The results of the relationship between stress and the glycemic index. were used to plot the estimation curve which showed a positive correlation between the stress and HbA_{1c} levels (Figure 3). Thus, as the stress levels increased, so did the HbA1c levels.

Table 2. Correlation between stress levels and fasting blood glucose levels (FBS), post-prandial blood glucose levels (PPBS) and HbA1c levels (n=1,890 patients)

Variables	n	r	significance
Stress levels X fasting blood glucose levels	1,890	.671	P<0.05
Stress levels X post-prandial blood glucose levels	1,890	.568	P<0.05

Discussions and Conclusion

There was a significant positive correlation between the stress levels and FBS, while PPBS had no significant relation with it. Stress levels were found to adversely affect treatment adherence among the subjects. Being negatively correlated and significantly so, increased levels of stress were associated with very poor adherence while those with perfect adherence were found to be stress-free (Lloyd, Smith & Weinger, 2005). This aspect of the study brings light to the fact that mental health and counselling should always be

a part of proper diabetic treatment regimen. The interplay between different aspects of treatment will greatly benefit the patients, especially since the ones who need the most help in procuring medicines for diabetic treatment are also the ones who are very much stressed (lower socioeconomic category of people). Only when the mental health issues and stress of a patient are addressed, will it be a comprehensive and rewarding consultation. Since dealing with stress will aid the patient's part in his/her own treatment, it will provide better results on the adherence front (Vasanth, Ganesh & Shanker, 2017; Kalra, Jena & Yeravdekar, 2018). As far as the glycemic index was concerned, greater treatment adherence kept it at bay while higher stress was found to increase the HbA1C levels This gives an idea about how adherence and stress are very important aspects in controlling the glucose levels. The most common reasons for non-adherence to treatment were lack of awareness, poverty and alcoholism. Stress and illiteracy came in next. Thus, the treatment areas should also include treating conditions like alcoholism, counseling and alleviating stress, educating the patient regarding the disease, its treatment and increase self-efficacy to patient (Chienwattanasook & Jermsittiparsert, 2019). Only when attention is paid to all these aspects, will the disease truly be under control and the treatment be called successful.

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References

[1] Holt TA, Kumar S. (2010). ABC of diabetes. Oxford: Wiley-Blackwell.

[2] Wild S, Roglic G, Green A, Sicree R, King H. (2004). Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. Diabetes Care. 27: 1047-1053.

[3] Miller GE, Chen E, Parker KJ. (2011). Psychological stress in childhood and susceptibility to the chronic diseases of aging: moving toward a model of behavioral and biological mechanisms. Psychol Bull. 137: 959-997.

[4] Pearce MJ, Pereira K, Davis E. (2013). The psychological impact of diabetes: A practical guide for the nurse practitioner. J Am Assoc Nurse Pract. 25: 578- 583.

[5] Li J, Jarczok MN, Loerbroks A, Schöllgen I, Siegrist J, et al. (2013). Work stress is associated with diabetes and prediabetes: cross-sectional results from the MIPH Industrial Cohort Studies. Int J Behav Med. 20: 495-503.

[6] Aschbacher K, Kornfeld S, Picard M, Puterman E, Havel PJ, et al. (2014). Chronic stress increases vulnerability to diet-related abdominal fat, oxidative stress, and metabolic risk. Psycho neuro endocrinology. 46: 14-22.

[7] Beardsley G, Goldstein MG. (1993). Psychological factors affecting physical condition. Endocrine disease literature review. Psychosomatics. 34: 12-19.

[8] Anderson RJ, Freedland KE, Clouse RE, Lustman PJ. (2001). The prevalence of comorbid depression in adults with diabetes: a meta-analysis. Diabetes Care. 24: 1069– 1078.

[9] Ciechanowski PS, Katon WJ, Russo JE. (2000). Depression and diabetes: impact of depression symptoms on adherence, function, costs. Arch Intern Med. 160: 3278– 3285.

[10] Zhang J, Markides KS, Lee DJ. (1991). Health status of diabetic Mexican Americans: results from the Hispanic HANES. Ethn Dis. 1:273–279.

[11] Leedom L, MeehanWP, Procci W, Zeidler. (1991). A:Symptoms of depression in patients with type II diabetes mellitus. Psychosomatics. 32:280–286.

[12] Lustman PJ, Anderson RJ, Freedland KE, de Groot M, Carney RM. (2000). Depression and poor glycemic control: ameta-analytic review of the literature. Diabetes Care. 23: 434–442.

[13] Trief PM, Grant W, Elbert K, Weinstock RS. (1998). Family environment, glycemic control, and the psychosocial adaptation of adults with diabetes. Diabetes Care 21: 241–245.

[14] World Health Organization. (2015). The Kingdom of Thailand health system review (Health Systems in Transition. 5(5).

[15] Bureau of Non-Communicable Diseases, Department of Disease Control, Ministry of Public Health. (2004). Report on Behavioral Risk Factors Surveillance System (BRFSS).

[16] Bureau of Health Policy and Strategy. (2016). Ministry of Public Health. Thailand Health Profile 2010–2015. [Online]. Available from: http://www. moph.go.th/stat1.php.Department of Mental Health, B.E. Suanprung stress test. Retrieved from http://www.dmh.go.th/test/stress/.

[17] American Diabetes Association. (2008). Standards of medical care in diabetes-2008. Diabetes Care. 31(Suppl 1): S12-54.

[18] Lloyd C, Smith J, Weinger K. (2005). Stress and Diabetes: A Review of the Links. Diabetes Spectrum. 18(2): 121-127. [Online]. Available from:https://doi.org/10.2337/diaspect.18.2. 121.

[19] Vasanth R, Ganesh A, Shanker R. (2017). Impact of stress on type 2 Diabetes Mellitus Management. Psychiatria Danubina. 29(3): pp 416-421.

[20] Kalra S, Jena B.N, Yeravdekar R. (2018). Emotional and Psychological Needs of People with Diabete. Indian J Endocrinol Metab. 22(5): 696–704. doi: 10.4103/ijem.IJEM_579_17

[21] Chienwattanasook K, Jermsittiparsert K. (2019). Factors Affecting Job Stress among Employees in the Banking Sector of Malaysia. International Journal of Innovation, Creativity and Change. 6(2): 288-302.