Hypoglycemic Effect of Sitting Breathing Meditation Exercise on Type 2 Diabetes at Wat Khae Nok Primary Health Center in Nonthaburi Province

Sompong Chaiopanont MD*

* Division of Preventive and Social Medicine, Pranangklao General Hospital, Nonthaburi

**Objective:** To evaluate the hypoglycemic effect of Sompong Kantaradusdi-Triamchaisri technique1 (SKT1) of sitting breathing meditation exercise on type 2 diabetic patients.

**Material and Method:** This quasi experiment study was performed on type 2 diabetic patients at Wat Khae Nok primary health center from April to May 2007 for a two-week period every Tuesday of the week (3 visits). At the first visit, the patients were educated about diabetes self care after breakfast. At the second and third visit, the participants were trained to practice SKT1 as intervention after breakfast. Post prandial plasma glucose and blood pressure before and after the intervention were recorded. Descriptive statistics and paired t-test were used to analyze the study data.

**Results:** Fifty patients participated in the present study, 11 were males and 39 females. They had a mean age of 63.1 years (range 42-80). The present study revealed that SKT1 significantly reduced levels of postprandial plasma glucose by 19.26 ± 30.99 mg/dl, (p < 0.001) in the second visit, and 17.64 ± 25.48 mg/dl, (p < 0.001) in third week visit. Furthermore, systolic blood pressure in the second visit was significantly decreased by 6.49 ± 11.77 mmHg, (p < 0.001). Diastolic blood pressure in the third visit was also significantly decreased by 3.04 ± 9.79 mmHg, (p < 0.05).

**Conclusion:** The present study showed that SKT1 practice in type 2 diabetic patients had a post prandial hypoglycemic effect and a slight reduction to systolic and diastolic blood pressure.

**Keywords:** Plasma glucose, Sitting breathing meditation exercise-SKT1, Type 2 diabetes

**Diabetes** is an important disease that leads to many complications that affect the quality of life, such as retinopathy, nephropathy and neuropathy. Associated illnesses include hypertension, dyslipidemia, coronary heart disease, obesity and metabolic syndrome. The costs of medical care for diabetes and complications are consequently very high\(^1\). During the year 2003-2005, there were 3.2 million diabetic patients in Thailand\(^2\). In Nonthaburi province, by the year 2005, there were 2100 diabetic patients\(^3\).

American Diabetes Association (ADA) stated that diabetes needs continuing medical care and patient self-management education to prevent acute complications and to reduce the risk of long-term complications. Prospective randomized control trials such as the Diabetes control and complications trial (DCCT) and the United Kingdom prospective diabetes study (UKPDS) have shown that improved glycemic control is associated with sustained decreases in the rates of retinopathy, nephropathy, and neuropathy. Glycemic control comprises of diabetes self-management education, medical nutrition therapy, physical activity, psychosocial assessment and care, medicines including oral hypoglycemic drugs and insulin injection\(^4\).

Physical activity can improve glycemic control, and reduce the risk of cardiovascular disease (CVD). Before beginning a program of physical activity more vigorous than brisk walking, the patient’s age, previous physical activity level, and conditions that might be associated with CVD or that might contraindicate
Certain type of exercise or predispose to injury, such as uncontrolled hypertension, severe autonomic neuropathy, and retinopathy or macular edema, should be considered.

Several studies explored meditation, breathing exercise, Qigong, biofeedback techniques, and other stress relaxation methods. They revealed hypoglycemic effect, decreased blood pressure and reduced cholesterol levels. Somporn Kantaradusdi-Triamchaisiri technique (SKT1) of sitting breathing meditation exercise was developed by Kantaradusdi-Triamchaisiri S. and tested in diabetic patients at Ongkaruk Hospital and Prapok-klao Hospital. The results showed that PPG was reduced. Therefore, the purpose of the present study was to evaluate the hypoglycemic effect of SKT1 on type 2 diabetic patients at Wat Khae Nok Primary health care center in Nonthaburi province, Thailand.

**Material and Method**

Between April and May 2007, 50 patients diagnosed as type 2 diabetes at Wat Khae Nok Primary Health Center under the responsibility of Preventive and Social Medicine Division of Pranangkla General Hospital Nonthaburi voluntary enrolled with purposive sampling. The present study was designed as a quasi-experiment, one group before and after intervention (pre-post test). The inclusion criteria for the participants were being type 2 diabetes, without coronary heart disease, cataract and nephropathy, able to communicate, understand the questions well, and give voluntary informed consent. Patient’s demographic data, sex, age, marital status, education levels, occupation, family history of diabetes, exercise habit, and blood pressure, was collected before the intervention.

The patients visited every Tuesday for a two-week period. At the first visit, the participants had fasting blood glucose (FBG) checked, and had a bowl of rice soup with minced pork and celery vegetable. After half an hour, the authors collected a blood sample for pre-intervention post prandial plasma glucose (PPG1), then the health care team educated the participants about diabetes self care. Half an hour later, the authors collected the post-intervention post prandial plasma glucose (PPG2).

1st visit: FBS meal PPG1 education PPG2

2nd, 3rd visit: FBS meal PPG1, SBP1/DBP1

SKT1 practice PPG2, SBP2/DBP2

At the second and third visit, the participants had their blood tested the same as at the first visit. Instead of diabetes care education, the patients were trained to practice SKT1 in a sitting position, which was done by slowly, deep inhale while counting 1, 2, 3, 4, and 5 in their mind, then holding their breath for a moment while counting 1, 2, and 3 in their mind, after that a slow long exhale while counting 1, 2, 3, 4, and 5 in their mind until the end of the respiratory cycle. The participants repeated the practice for 30 cycles, which lasted time about 30 minutes. FBG, PPG1, PPG2 and blood pressure pre and post-intervention were also recorded.

The research proposal was approved by the Institutional Review Board.

Demographic data of the participants were statistically analyzed and presented in terms of median range, mean, standard deviation (SD) and percentage. Paired t-test was used to analyze mean and standard deviation of post prandial plasma glucose and blood pressure before and after the intervention.

**Results**

Fifty type 2 diabetic patients participated in the present study, 11 were males and 39 females. The median age was 63.1 years (range 42-80) and 64% lived as a couple. Primary school level of education was 74%. Half of all the participants were housewives. Seventy percent had no family history of diabetes. Half of the participants rarely exercised.

At the first visit, mean post prandial plasma glucose levels, pre and post-diabetes care education were recorded as baselines (192.08 mg/dl, 197.60 mg/dl). At the second and third visit, the same group was trained to practice SKT1 as intervention, mean post prandial plasma glucose levels pre and post intervention were recorded (second visit 187.74, 168.48 mg/dl; third visit 191.96, 174.32 mg/dl). Mean blood pressures also were recorded pre and post intervention (second visit 141.45/81.45, 134.96/80.19 mmHg, third visit 139.30/79.94, 138.48/76.90 mmHg). The results of the present study showed that the PPG1 and PPG2 tested before and after SKT1 during the second and third visit were reduced with statistical significance by 19.26 + 30.99 mg/dl (p < 0.001) and 17.64 + 25.48 mg/dl (p < 0.001), but there was no significant difference during the first visit. Systolic pressure at the second visit session was also significantly decreased by 6.49 + 11.77 mmHg (p < 0.001). Diastolic pressure at the third visit was significantly decreased by 3.04 + 9.79 mmHg (p < 0.05) as shown in Table 1.
Discussion

The main objective of the present study was to assess the hypoglycemic effect of SKT1 as complementary treatment of type 2 diabetic patients. After 2 weeks of SKT1 practice half an hour each session, post prandial plasma glucose levels were significantly reduced at the second and third visit. Systolic blood pressure at the second visit and diastolic blood pressure at the third visit were significantly decreased. The present results were comparable with the findings in clinical trials that assessed the effects of Qigong(7-9,13). The studies of Qigong relaxation exercise for 4 months intervention in type 2 diabetic patients, demonstrated significant improvement in HbA1c level(7). Qigong practice for 16 weeks in essential hypertension patients also significantly decreased blood pressure and total cholesterol(8,9,13). There was a significant reduction of norepinephrine, metanephrine and epinephrine that Qigong may stabilize the sympathetic nervous system which urinary catecholamines and blood pressure were decreasingly detected(13). The effect of transcendental meditation for 16 weeks on components of the metabolic syndrome and coronary heart disease showed improvement in blood pressure and insulin resistance(11). Barnes et al examined the impact of TM on cardiovascular function at rest and during acute stress in adolescents with high normal blood pressure, exhibited greater decrease in systolic blood pressure, heart rate and cardiac output(9). The present study showed results only on PPG and blood pressure, but did not evaluate the effect on HbA1c, which would have been due to time limitation of a two-week period that was considered from convenience of the patients to participate in. However, other studies have shown that reducing PPG contributes to reduce HbA1c in type 2 diabetic patients(14,15).

Stress has long been considered an important factor in type 2 diabetes, and frequently found in type 2 diabetes mellitus (T2DM) patients higher than healthy individuals(16,17). ADA recommended many ways of relaxation, such as breathing exercises, progressive relaxation therapy, exercise, and replace bad thoughts with good ones technique(18). Stress management can result in a clinically significant reduction in HbA1C(6,7,10). Stress can affect blood glucose levels in type 2 diabetes, stress hormones that include adrenaline and cortisol play role in their primary effects to mobilize stored energy into glucose and fatty acids in the blood stream. Stress also has direct effects on the nerves controlling the pancreas, which inhibit insulin release. In healthy individuals, these energy sources can be quickly utilized. However, in people with diabetes, the lack of insulin or the presence of insulin resistance causes the newly released glucose to build up in the blood stream(16,19). The deterioration of the autonomic nervous system was associated with poor glycemic control in diabetic patients(20). Meditation has the effects to suppress stress hormones(6,21), reduce sympathetic activity(22), and enhance parasympathetic activity that result in decreasing blood pressure, reducing plasma glucose level(5,23). Similar to the present study that SKT1 practice resulted in decreasing systolic and diastolic blood pressure and reducing post prandial plasma glucose.

Table 1. Comparison of the means of post prandial glycemia (PPG), systolic and diastolic blood pressure (SBP, DBP) before and after SKT1 intervention

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Number</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visit 1</td>
<td>PPG1</td>
<td>192.08</td>
<td>64.08</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>PPG2</td>
<td>197.60</td>
<td>83.75</td>
<td></td>
</tr>
<tr>
<td>Visit 2</td>
<td>PPG1</td>
<td>187.74</td>
<td>63.93</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>PPG2</td>
<td>168.48</td>
<td>61.46</td>
<td></td>
</tr>
<tr>
<td>Visit 3</td>
<td>PPG1</td>
<td>191.96</td>
<td>46.56</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>PPG2</td>
<td>174.32</td>
<td>45.64</td>
<td></td>
</tr>
<tr>
<td>Visit 2</td>
<td>SBP1</td>
<td>141.45</td>
<td>23.41</td>
<td>47</td>
</tr>
<tr>
<td></td>
<td>SBP2</td>
<td>134.96</td>
<td>21.21</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DBP1</td>
<td>81.45</td>
<td>10.91</td>
<td>47</td>
</tr>
<tr>
<td></td>
<td>DBP2</td>
<td>80.19</td>
<td>9.71</td>
<td></td>
</tr>
<tr>
<td>Visit 3</td>
<td>SBP1</td>
<td>139.30</td>
<td>24.07</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>SBP2</td>
<td>138.48</td>
<td>26.42</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DBP1</td>
<td>79.94</td>
<td>12.69</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>DBP2</td>
<td>76.90</td>
<td>12.44</td>
<td></td>
</tr>
</tbody>
</table>
In addition, baroreceptor and chemoreceptor are the modulator parts of the autonomic nervous system that involve the mechanisms related to hypertension and insulin resistance\textsuperscript{(24)}. An increase in baroreceptor sensitivity results in decreasing blood pressure and improving insulin resistance\textsuperscript{(25-29)}.

The present study showed that deactivation of chemoreceptor reflexes also can cause reduction in blood pressure and plasma glucose level\textsuperscript{(30)}. The arterial baroreflexes also have a powerful inhibitory influence on the chemoreflexes\textsuperscript{(31)}. Several experimental studies indicated that reducing postprandial dysmetabolism (postprandial state characterized by abnormally increased levels of glucose and lipids) appears to significantly slow atherosclerotic progression and may improve cardiovascular prognosis\textsuperscript{(32,33)}.

In conclusion, the present study showed that SKT1 practice for a two-week period, might affect the stress hormones and autonomic nervous systems, by not inducing stress hormones. This suppresses sympathetic activity, and enhances parasympathetic activity via the increased baroreceptor sensitivity. The deactivation of chemoreceptor reflexes result in significantly reducing both systolic & diastolic blood pressure and post prandial plasma glucose, which benefit in prevention of cardiovascular risk factor. Further study should evaluate SKT1 practice for a longer than 16 weeks period to explore whether SKT1 has the effects on HbA1c and lipid profiles such as total cholesterol and triglycerides.

Acknowledgements

The author wishes to thank Assoc Prof. Dr. Somporn Kantharadusdi-Triamchaisri, Faculty of Public Health, Mahidol University for allowing the SKT1 technique and assistance in writing the manuscript. The author wishes to thank Dr. Prapon Tangsriatkul, Director of Pranangklao General Hospital for allowing the study, and Dr. Somsak Ngamakeur, Chief of Preventative and Social Medicine Division, Pranangklao General Hospital for allowing and contributing to the study. The author wishes to thank Dr. Worranan Prasananikom, Faculty of Medicine Ramathibodi Hospital, Mahidol University for her help and advice during the preparation of this manuscript.

References

14. Bastyr EJ, III, Stuart CA, Brodows RG, Schwartz S,


ศึกษาผลการลดระดับน้ำตาลในเลือดของการปฏิบัติสมาธิออกกำลังกายประสาทสัมผัส Sitting Breathing Meditation Exercise ในผู้ป่วยเบาหวานชนิดที่ 2 ที่ศูนย์สุขภาพชุมชนวัดแคนอก จังหวัดนนทบุรี

สมพงษ์ ชัยโอภานนท์

วัตถุประสงค์: เพื่อศึกษาผลการลดระดับน้ำตาลในเลือดของการปฏิบัติสมาธิออกกำลังกายประสาทสัมผัสด้วยวิธี Somporn Kantaradusdi-Triamchaisri technique1 (SKT1) ในผู้ป่วยเบาหวานชนิดที่ 2

วิธีการ: การศึกษาเป็นการทดลองในผู้ป่วยเบาหวานชนิดที่ 2 ที่ศูนย์สุขภาพชุมชนวัดแคนอก จังหวัดนนทบุรี ระหว่างเดือนมีนาคม พ.ศ. 2550 ถึง พฤศจิกายน พ.ศ. 2550 ดำเนินการศึกษาทุกวันอังคารต่อเนื่องยาวทั้ง สัปดาห์ รวมทั้งหมด 3 สัปดาห์ ในการศึกษาผู้ป่วยจะได้รับการประสานงานด้วยการฝึกปฏิบัติ SKT1 โดยมีการตรวจสอบการได้รับการฝึกปฏิบัติและผลการลดระดับน้ำตาลในเลือด และความดันโลหิตผ่านการบันทึกข้อมูลทุกวัน

วัสดุและวิธีการ: การศึกษาเป็นการทดลองในผู้ป่วยเบาหวานชนิดที่ 2 ที่ศูนย์สุขภาพชุมชนวัดแคนอก จังหวัดนนทบุรี ระหว่างเดือนมีนาคม พ.ศ. 2550 ถึง พฤศจิกายน พ.ศ. 2550 ดำเนินการศึกษาทุกวันอังคารต่อเนื่องยาวทั้ง สัปดาห์ รวมทั้งหมด 3 สัปดาห์ ในการศึกษาผู้ป่วยจะได้รับการประสานงานด้วยการฝึกปฏิบัติ SKT1 โดยมีการตรวจสอบการได้รับการฝึกปฏิบัติและผลการลดระดับน้ำตาลในเลือด และความดันโลหิตผ่านการบันทึกข้อมูลทุกวัน

ผลการศึกษา: ผู้ป่วยเบาหวานชนิดที่ 2 จำนวน 50 คน เป็นเพศชาย 11 คน หญิง 39 คน อายุเฉลี่ย 63.1 ปี (42-80 ปี) พบว่าระดับน้ำตาลในเลือดหลังอาหาร postprandial plasma glucose (PPG) ลดลงอย่างมีนัยสำคัญทางสถิติ (ครั้งที่ 2 ลดลง 19.26 ± 30.99 mg/dl, p < 0.001; ครั้งที่ 3 ลดลง 17.64 ± 25.48 mg/dl, p < 0.001) และยังพบว่าความดันซิสโตลิคในครั้งที่ 2 ลดลงอย่างมีนัยสำคัญทางสถิติ (6.49 ± 11.77 mmHg, p < 0.001) ความดันไดแอสโตลิคในครั้งที่ 3 ลดลงอย่างมีนัยสำคัญทางสถิติ (3.04 ± 9.79 mmHg, p < 0.05)

สรุป: การศึกษาแสดงให้เห็นว่าการปฏิบัติสมาธิออกกำลังกาย SKT1 มีผลลดระดับน้ำตาลในเลือดหลังอาหารสำหรับผู้ป่วยเบาหวานชนิดที่ 2 และมีผลลดความดันโลหิตทั้งซิสโตลิคและไดแอสโตลิคได้เล็กน้อย