

Usefulness of a Novel Secular Mindful Exercise Model (SMEM) in Type-2 Diabetes and Dyslipidemia

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Abstract

Background: The role of mindful physical activity in the amelioration of risk factors of type-2 diabetes (2DM) and dyslipidemia have been reported in the literature. However, there is no consensus on what should be the universal dosage and duration optimum for the prevention and treatment of diabetes. In this study, we examined the effect of a novel short Secular Mindful Exercise Model (SMEM) in 2DM patients.

Methods: 100 patients with known 2DM and dyslipidemia were selected for the study. Diabetic patients on hypoglycemic oral medication were also included in this study. Patients attending the diabetic clinic were randomized into control group (n=50) and study group (n=50) patients each. The study group was on oral hypoglycemic drugs, lifestyle modification and SMEM for a period of 6 months. The control group was prescribed oral hypoglycemic drugs only and did not perform SMEM during this period.

Results: 6 months of study showed that the study group had a significant reduction in total cholesterol, triglycerides and LDL cholesterol. Significant elevation in HDL was recorded in the study group. In Control group showed a significant increase in body weight. There was a significant increase in total cholesterol, triglycerides and a decrease in HDL. The bodyweight increase could be attributed to drugs like Sulphonyl urea.

Conclusions: This study demonstrates that practice of SMEM can help in lowering lipid profiles, lower BMI, and lowering blood glucose levels which can have a long term beneficial effect on Micro and macro-vascular complications in diabetes. SMEM is a secular, inexpensive and highly feasible activity. Therefore; SMEM can be used as an adjunct along with medical diabetic treatment.

Keywords: Diabetes, Dyslipidemia, SMEM, Mindful Physical Activity, Lipid Profile

I. INTRODUCTION

Diabetes is the 7th leading cause of death in the US. The prevalence of 2DM is increasing in the United States (US) and worldwide. In 2012, 9.3% of the US population had diabetes, of which approximately 90% was type 2 diabetes. The estimated annual economic costs in the US were \$245 billion in 2012^[1, 2, 3]. In India diabetes is increasing at a rapid rate and is the leading cause of death. In India 2DM increase projected to be 60 million by 2017. Novel, inexpensive and effective intervention are needed to tackle 2DM. Exercise and mindful physical activities have been effective in the management of diabetes. Mindfulness often is defined as the ability to attend in a nonjudgmental way to one's own physical and mental processes during ordinary, everyday tasks^[4, 5]. Mindfulness has shown a positive association with greater self-regulation and ability to notice cravings without acting on them^[6-9]. Mindfulness meditation interventions have been shown to influence these same regions in the prefrontal cortex,^[10] which is supportive evidence that mindfulness and related interventions such as mindful physical activities may be effective for self-regulation to limit excessive food consumption, with resulting risk for obesity and type- 2 diabetes. However, the mechanisms linking mindfulness to glucose regulation have not been established using modern analytic mediation approaches.

Diabetes mellitus is a metabolic disorder resulting in hyperglycemia over a prolonged period resulting in symptoms like polyuria (frequent urination), polydipsia (increased thirst), and polyphagia (increased hunger), weight loss, numbness, tingling etc.^[11]. In 2DM pancreas either do not produce adequate amounts or body cannot effectively use the insulin it produces^[12]. Insulin is a key hormone that regulates blood sugar level in blood. Hyperglycemia over long time in the body leads to serious complications like Neuropathy, Retinopathy, Nephropathy, Autonomic nervous system disturbances and limb amputations^[13, 14]. Diabetes often leads to cardiovascular disorder, stroke and other complications^[15]. Diabetes leads to a

huge socio-economic burden. Global health expenditures to prevent and treat diabetes and its complications will total at least US dollar 7.3 billion in 2015. By 2040, this number will exceed some USD 12.9 billion. An average of USD 703 per person will be spent on diabetes in 2015 globally [16]. At present number of anti-diabetic agents are available to correct hyperglycemia and dyslipidemia generated by diabetes pathology but due to risk profile long term use of these drugs are restricted [17, 18]. So, there is need of low cost, non-medication, natural therapies to prevent and treat 2DM effectively. Alternative treatments like diet, lifestyle changes and natural medicines are already in

practice. Examples are Ayurveda, Yoga, Salat, siddha, Unani acupuncture, Homeopathy, biofeedback, aromatherapy, relaxation, and many others [19]. In this study, we have examined the effect a novel short secular mindful exercise model (SMEM) in type-2 diabetes patients.

II. MATERIALS AND METHODS

A. Smem Protocol

Details about SMEM are given in Table-1. The total time taken to perform SMEM is 10 minutes.

Table-1: Procedure of Secular Mindful Exercise (SMEM)

Step No.	Activity	Time in Minutes
1	Washing of hands, face and feet immediately prior to SMEM session	2
2	Stand on comfortable floor and relax in the standing position with your eyes closed	1
3	While in standing position breath smoothly and focus attention on your breathing sound	1
4	<i>(This focus on brain should not be disconnected till the end of the SMEM session.)</i>	
5	Slowly bend and touch your feet thumb	1
6	Slowly stand	1
7	Slowly sit on your thighs with knees facing forward, sole of your feet facing backwards	1
8	Slowly touch your forehead to the ground. (While doing this support your body with both your palms and knees	2
9	Slowly sit and relax	1
	Total Time	10

Three sessions of SMEM per day: Morning, Afternoon, before bedtime (Night), Total time required 10 minutes

Patients with no history of any mindful or non-mindful physical activity were included in the study. Patient’s medical and dietary history was recorded before including in the study. Age, gender, disease and treatment history documented, fasting blood glucose, post prandial blood glucose, lipid parameters like triglycerides (TG), total cholesterol (TC) and high-density lipoprotein-cholesterol (HDL-C) and total cholesterol was estimated.

Alcoholics, pregnant, patients receiving drugs like steroids, coronary artery disease, smokers, cerebrovascular diseases, immuno-compromised patients. Patients involved in physical exercise such as jogging, brisk walking and patients performing other type of mindful physical activities such as yoga, salat, Buddhist meditation, Tai Chi, Karate or gym were excluded from the study.

The study was approved by the institution’s ethical committee. Written consent of the patient was taken and the protocol was explained thoroughly. Patients were trained to perform the SMEM activity before the start of the study. Patients were randomized into

control group of 50 patients, out of which 24 males and 26 females and Study group of 50 patients, out of which 26 males and 24 females. The study group was on oral hypoglycemic drugs and in addition followed lifestyle modification plus practice of SSMEM for a period of 6 months. The control group was on oral hypoglycemic drugs and did not perform physical activity or mindful exercises during this study period. The only physical activity in this group was the activities required to perform daily chores. The control group was followed in outpatient department monthly. There were no alterations made in the treatment and dietary habits of either group during the study period. Both the groups were advised to continue with their carbohydrate restricted fiber rich.

III. RESULTS

Demographic details of patients given in (Table 1). The average duration of diabetes in the participants was 5 years. Both the groups were similar in respect to mean age, sex, weight, glycemic control, serum triglycerides and HDL levels. Baseline data was collected 12 hours before the start of the study. Total

cholesterol and LDL levels of the patients in the study group were higher than the control group (Table-2). The study showed that 6-months of SMEM practice resulted in a significant decrease in the weight from 65.17±4.57 to 61.80±4.69 kg. Baseline fasting and post prandial glucose levels and HDL were lower in the study group. Table-3 shows that the mean total cholesterol before SMEM was 240.36±29.01 mg% and was reduced to a mean of 214.11±31.48 mg%.

Triglycerides showed a significant reduction from 158.49±39.06 mg% to 134.62±26.19 mg% while the LDL reduced from 145.24±24.10 to 121.36±32.88 mg%. There was a significant elevation in HDL from 45.29±8.92 mg% to 50.15±5.19 mg % (Table3). After a period of 6-months the control group showed a significant increase in body weight, significant increase in total cholesterol, triglycerides and a decrease in HDL (Table- 4).

Table-2: Baseline Data of the Patients

Parameters	Control group <i>n</i> =50	Study group <i>n</i> = 50
Mean age (years)	40.28±11.68	41.27±6.99
Male	14 (56%)	12 (48%)
Female	11 (44%)	13 (52%)
Weight (kg)	65.38±4.49	65.17±4.57
FBS (mg/dl)	164.12±34.29	160.81±41.55
PPBS (mg/dl)	257.13±84.20	249.31±78.41
Total cholesterol (mg/dl)	230.14±39.20	240.36±29.01
Triglyceride (mg/dl)	181.47±46.59	158.49±39.06
LDL cholesterol (mg/dl)	130.22±29.34	145.24±24.10
HDL cholesterol (mg/dl)	45.21±5.12	45.29±8.92

IV DISCUSSION

Several studies have investigated the role of mindfulness-based interventions in glucose regulation in diabetic patients,^[8,9]. These studies have shown that significant glucose regulation improvements take place in specifically trained participants in mindfulness. Providing training in mindfulness behaviors will improve glucose regulation.^[8,9] Mindful physical activities have been proven to be effective in the amelioration and treatment of many non-communicable diseases. The role of mindful exercise on diabetes and metabolic syndrome has been widely reported^[10-15]. Though mindful physical activities have therapeutic benefits on human health, most of these exercises are either lengthy or need special preparation.

In this study, we designed a very simple activity that embodies mindful-musculo-skeletal movements, attention-training and pro-gravity posturing. This model is very simple easy for any age and can be performed at any place by any one. Most

importantly SMEM is a secular model that does not hinder people of faith or cultures from adopting it in their daily life. SMEM can be also acts a preventative strategy for many non-communicable diseases. In this study, we have analyzed the effects of 6-months of daily practice of SMEM on diabetes and dyslipidemia. The practice of SMEM resulted in a decrease in all those risk factors that pre-dispose individuals to non-communicable diseases, especially that one arising from glycemic and lipid abnormalities.

Table 3: Pre-And Post Data: SMEM Study Group.

Parameters(n=50)	Pre-SEMEM (Mean±SD)	Post-SEMEM (Mean±SD)
Weight(kg)	65.17±4.57	61.80±4.69
FBS	160.81±41.55	118.12±20.35
PLBS	249.31±78.41	160.42±39.60
LDL cholesterol (mg/dl)	145.24±24.10	121.36±32.88
HDL cholesterol (mg/dl)	45.29±8.92	50.15±5.19
Triglycerides (mg/dl)	158.49±39.06	134.62±26.19
Total cholesterol (mg/dl)	240.36±29.01	214.11±31.48

Table 4: Pre-And Post Data: Control Group.

Parameters (n = 50)	Initial value (Mean±SD)	Follow up (Mean±SD)
Weight (kg)	62.17±4.67	63.03±5.10
FBS	164.12±34.29	138.12±20.35
PLBS	257.13±84.20	196.17±41.28
LDL cholesterol (mg/dl)	130.22±29.34	129.10±23.82
HDL cholesterol (mg/dl)	45.21±5.12	40.90±7.24
Triglycerides (mg/dl)	181.47±46.59	190.11±60.28
Total cholesterol (mg/dl)	230.14±39.20	260.88±30.59

American Diabetes Association it recommends moderate exercise training of at least 150 min/week, alone or in conjunctions with resistance exercise training 3 times per week, to better glycemic control, enhanced insulin sensitivity, and weight loss¹¹. The cornerstone treatment for prevention and treatment diabetes is regular exercise training which is underutilized by the diabetic patient. In this context, the importance of our SMEM that accounts for 30 minutes of exercise plus mindfulness and 210 minutes per week of mindful exercise that exceeds what the American diabetic association has recommended for prevention of

diabetes. SMEM also comes with ease of use, safety, and multiple psychological benefits like reduction of stress and mentally well-being.

SMEM is a low-cost intervention strategy to improve physical and psychological well-being. SMEM provides slow rhythmic movements; by easy extensions and bending stimulating muscles which can results in stimulation of the organs and glands. SMEM could be also useful in patient with metabolic syndrome. Major recent advanced research has shown that chronic stress (psychological) and negative affective states are the contributing factors towards the pathogenesis and progression of insulin resistance, intolerance of glucose, hypertension and other IRS related conditions^[20-21]

V CONCLUSION

Mindful physical activity -SMEM may serve as a safe tool to improve glycemic control, prevent hyperlipidemia, the major risk factors of diabetes and cardiovascular disease respectively. This study also demonstrated a significant, association of mindfulness in amplification of the benefits of the exercise on diabetes Mellitus. Prior washing of specific zones of the body such as hands, face, feet, may stimulate certain neuronal activity and increase parasympathetic tone which may have an indirect role in the amelioration of type-2 diabetes. Therefore, targeted exposure to water before every session of SMEM may have additional benefits. Based on the results we suggest that SMEM can be used an adjunct along with other conventional medical therapies. SMEM is simple, feasible and goes a long way in maintaining optimum health especially in preventing type-2 diabetes.

ACKNOWLEDGMENT

Authors are grateful to Kannur Medical College and Swasth Hindustan Mission for the continuous support during the project.

There is no conflict of interest

REFERENCES

- [1] Centers for Disease Control and Prevention (CDC) National Diabetes Statistics Report: Estimates of Diabetes and Its Burden in the United States, 2014. Atlanta, GA: CDC, US Department of Health and Human Services; 2014.
- [2] Epstein RM. Mindful practice. JAMA. 1999;282(9):833–839.
- [3] Brown KW, Ryan RM. The benefits of being present: mindfulness and its role in psychological well-being. J Pers Soc Psychol. 2003;84(4):822–848.
- [4] Brewer JA, Mallik S, Babuscio TA, et al. Mindfulness training for smoking cessation: results from a randomized controlled trial. Drug Alcohol Depend. 2011;119(1–2):72–80.
- [5] Brand M, Young KS, Laier C. Prefrontal control and internet addiction: a theoretical model and review of neuropsychological and neuroimaging findings. Front Hum Neurosci. 2014; 8:375.

- [6] Olson KL, Emery CF. Mindfulness and weight loss: a systematic review. *Psychosom Med.* 2015;77(1):59–67.
- [7] Tang YY, Holzel BK, Posner MI. The neuroscience of mindfulness meditation. *Nat Rev Neurosci.* 2015;16(4):213–225.
- [8] Ligara., “Diabetes Mellitus, Type2”, 2010, http://emedicine.medscape.com/article/181753_2. Williams textbook of endocrinology (12th ed.). Philadelphia: Elsevier/Saunders., 2010, ISBN. 978-1-4377-0324-5. pp. 1371–1435 3. National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), National Institutes of Health (NIH), US, 2015
- [9] Vos T, Flaxman AD, Naghavi M, Lozano R, Michaud C, Ezzati M, Shibuya K, Salomon JA, Abdalla S, Aboyans V, et al., “Years lived with disability (YLDs) for 1160 sequelae of 289 diseases and injuries 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010.”. *Lancet* 380 (9859), Dec 15, 2012, pp.2163–96.
- [10] Shi, Yuankai; Hu, Frank., “The global implications of diabetes and cancer”. *The Lancet* 383 (9933), 2014, pp. 1947–1948.
- [11] IDF Diabetes Atlas seventh edition, 2015
- [12] Bennett WL, Maruthur NM, Singh S, et al. Comparative effectiveness and safety of medications for type 2 diabetes: an update including new drugs and 2 -drug combinations. *Ann Intern Med.*, 154 2011, pp.602 –13.
- [13] Stephanie Aleskow Stein, Elizabeth Mary Lamos, Stephen N Davis. “A review of the efficacy and safety of oral antidiabetic drugs”, *Expert Opin Drug Saf.*, 12(2) 2013 Mar, pp. 153 –175.
- [14] Pizzorno J, Murray M., *Textbook of natural medicine.* edition. Missouri: Elsevier, 2007, <http://en.wikipedia.org/wiki/>
- [15] Hanson, Innes., “The benefits of yoga for adults with type 2 diabetes: a review of the evidence and call for a collaborative, integrated research initiative.” *Int J Yoga Therap.* 2013, pp.71 - 83
- [16] Dukhabandhu N, N Thomas, “Yoga - a potential solution for diabetes & metabolic syndrome”, *Indian J Med Res.*, 141(6), 2015 Jun, pp. 753 – 756.
- [17] Gregg JA, Callaghan GM, Hayes SC, Glenn-Lawson JL. Improving diabetes self-management through acceptance, mindfulness, and values: a randomized controlled trial. *J Consult Clin Psychol.* 2007;75(2):336–343.
- [18] Youngwanichsetha S, Phumdoung S, Ingkathawornwong T. The effects of mindfulness eating and yoga exercise on blood sugar levels of pregnant women with gestational diabetes mellitus. *Appl Nurs Res.* 2014;27(4):227–230.
- [19] Hartmann M, Kopf S, Kircher C, et al. Sustained effects of a mindfulness-based stress-reduction intervention in type 2 diabetic patients: design and first results of a randomized controlled trial (the Heidelberger Diabetes and Stress-study) *Diabetes Care.* 2012;35(5):945–947.
- [20] van Son J, Nyklicek I, Pop VJ, et al. Mindfulness-based cognitive therapy for people with diabetes and emotional problems: long-term follow-up findings from the DiaMind randomized controlled trial. *J Psychosom Res.* 2014;77(1):81–84.
- [21] Tovote KA, Schroevers MJ, Snippe E, et al. Long-term effects of individual mindfulness-based cognitive therapy and cognitive behavior therapy for depressive symptoms in patients with diabetes: a randomized trial. *Psychother Psychosom.* 2015;84(3):186–187.