CLINICAL RESEARCH STUDY

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A Blend of Sesame and Rice Bran Oils Lowers Hyperglycemia and Improves the Lipids

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ABSTRACT

BACKGROUND: Considering the health benefits of sesame oil and rice bran oil, the study was conducted to determine the extent to which the daily use of this blend of oils controls hyperglycemia and improves the lipid profile.

METHODS: In this 8-week open-label randomized dietary intervention study, 300 type 2 diabetes mellitus patients and 100 normoglycemic subjects were grouped as 1) normoglycemic subjects (n = 100) treated with sesame oil blend Vivo (Adani Wilmar, Ahmedabad, Gujarat, India), 2) type 2 diabetes mellitus patients treated with sesame oil blend (n = 100), 3) type 2 diabetes mellitus patients treated with glibenclamide (n = 100; 5 mg/d), and 4) type 2 diabetes mellitus patients treated in combination of glibenclamide (5 mg/d) and sesame oil blend (n = 100). Twelve-hour fasting blood glucose, glycated hemoglobin (HbA1c), and lipid profile followed by postprandial blood glucose were measured at baseline. Sesame oil blend was supplied to the respective groups, who were instructed to use as cooking oil for 8 weeks. Fasting and postprandial blood glucose was measured at week 4 and week 8, while HbA1c and lipid profile were measured at week 8.

RESULTS: At week 4 and week 8, type 2 diabetes mellitus patients treated with sesame oil blend or glibenclamide or combination of glibenclamide and sesame oil blend showed significant reduction of fasting and postprandial blood glucose ($P < .001$). HbA1c, total cholesterol, triglycerides, low-density lipoprotein cholesterol, and non-high-density lipoprotein cholesterol were significantly reduced ($P < .001$), while high-density lipoprotein cholesterol was significantly increased at week 8 ($P < .001$) in type 2 diabetes mellitus patients treated with the sesame oil blend or combination of glibenclamide and sesame oil blend; whereas glibenclamide-alone-treated type 2 diabetes mellitus patients showed a significant reduction of HbA1c ($P < .001$) only.

CONCLUSIONS: A novel blend of 20% cold-pressed unrefined sesame oil and 80% physically refined rice bran oil as cooking oil, lowered hyperglycemia and improved the lipid profile in type 2 diabetes mellitus patients.

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KEYWORDS: Hyperglycemia; Lipids; Sesame oil blend; Type 2 diabetes mellitus patients

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Type 2 diabetes mellitus has become a challenging global public health concern, and has become a tremendous worldwide social and economic burden because of its risk for cardiovascular diseases.[1] The incidence of type 2 diabetes mellitus patients is on the increase and it is estimated that there will be 366 million cases in 2030.[2] Metabolic and lifestyle factors, including obesity, diet, physical activity, and smoking, influence the risk of developing diabetes, as does genetics.[3-9] The increasing incidence of type 2 diabetes mellitus and the prevalence of cardiovascular risk emphasize the need for appropriate dietary modifications as a critical addition to the pharmacological intervention for preventing and treating them. Therefore, it is important to identify modifiable risk factors of diabetes mellitus, such as diet, and look for the beneficial foods that could help to reduce the risk of diabetes mellitus.

CLINICAL SIGNIFICANCE

- Cooking with a blend of unrefined cold-pressed sesame oil and physically refined rice bran oil effectively reduced hyperglycemia. However, a combination of sesame oil blend and antidiabetic medication yielded even more promising results to reduce hyperglycemia in patients with type 2 diabetes mellitus.
- Use of sesame oil blend as cooking medium for 8 weeks seemed to make a difference on lipid levels by reducing total cholesterol, triglycerides, low-density lipoprotein cholesterol, and non-high-density lipoprotein cholesterol, and increased high-density lipoprotein cholesterol.

Evidence from observational and experimental studies suggests that dietary factors have a major role in the prevention and management of diabetes mellitus.[10] Among the dietary factors, saturated fatty acids consumption has been implicated as one possible factor for diabetes risk.[11] Epidemiological studies have indicated that the replacement of foods high in saturated fatty acids with food sources of mono- and polyunsaturated fatty acids could be favorable in the prevention and progression of diabetes development.[12] Several studies have shown that edible oils rich in mono- and polyunsaturated fatty acids favorably affect the diabetes risk.[13,14] Sankar et al[15] reported that the use of sesame oil as cooking oil reduced blood glucose, glycated hemoglobin (HbA1c), and cholesterol, and thereby helped to control type 2 diabetes mellitus. Likewise, rice bran oil, an edible oil extracted from the inner husk of rice bran, rich in monounsaturated fatty acids, oryzanol, tocopherols, and tocotrienols lowered hypercholesterolemia and hyperglycemia in humans and animal models.[16,17] Gamma-oryzanol (mixture of ferulic acid esters of sterol and triterpenoids) has been shown to have both antidiabetic and cholesterol-lowering effects.[18,19]

A novel oils blend with a rich source of antioxidants, and mono- and polyunsaturated fatty acids, may provide increased opportunities for optimizing the unsaturated fatty acids/antioxidants as a dietary supplement to improve type 2 diabetes mellitus and other associated cardiovascular risk factors. It was hypothesized that a blend of sesame oil and rice bran oil may elicit different effects from what they reflect individually as cooking oil. The objective of the study, therefore, was to investigate the relative effects of an oils blend including cold pressed, un-refined, antioxidants and lignans-rich sesame oil and physically refined γ-oryzanol-rich rice bran oil (20:80) on hyperglycemia and lipid profile in individuals with type 2 diabetes mellitus.

MATERIALS AND METHODS

Subjects

Study subjects were men and women (n = 300) with newly diagnosed type 2 diabetes mellitus, with a mean (±SD) age of 50.5 ± 10.8 years. Normoglycemic subjects were men and women (n = 100) with a mean (±SD) age of 32.6 ± 10 years, and with normal plasma glucose levels. Type 2 diabetes mellitus patients were required to have no evidence of cardiovascular or liver disease; no usage of antidiabetic or cholesterol-lowering medication; no adherence to a prescribed diet; and no pregnancy or lactation. Lifestyle habits of the study participants, including smoking, alcohol intake, and physical activity, were obtained by a questionnaire, and the family history of type 2 diabetes mellitus was defined as a history of their parents, who were once diagnosed as having type 2 diabetes mellitus.

Study Design

Eligible type 2 diabetes mellitus patients and normoglycemic subjects referred by the diabetes outpatient clinics of the Hindu Rao Hospitals, New Delhi, and Dr. Ambedkar Multispecialty Hospital, Noida, India were randomized to the following treatment groups (**Figure 1**): 1) normoglycemic subjects treated with sesame oil blend (n = 100); 2) type 2 diabetes mellitus patients treated with sesame oil blend (n = 100); 3) type 2 diabetes mellitus patients treated with glibenclamide (n = 100; 5 mg/d); and 4) type 2 diabetes mellitus patients treated in combination of glibenclamide (5 mg/d) and sesame oil blend (n = 100). All participants were clinically assessed at baseline for 12-hour fasting blood glucose, HbA1c, total cholesterol (TC), triglycerides (TG), low-density lipoprotein cholesterol (LDL-C), non-high-density lipoprotein cholesterol (non-HDL-C), and high-density lipoprotein cholesterol (HDL-C) followed by postprandial blood glucose. Sesame oil blend was supplied to the respective groups at every 2-week interval for a maximum of 4-5 liters, and they were instructed to use it as the only cooking oil for 8 weeks. They were using mustard oil, palm oil, sunflower oil, and soybean oil at random prior to their inclusion in this study. In accordance with the daily requirement of calories from fat, we advised the participants

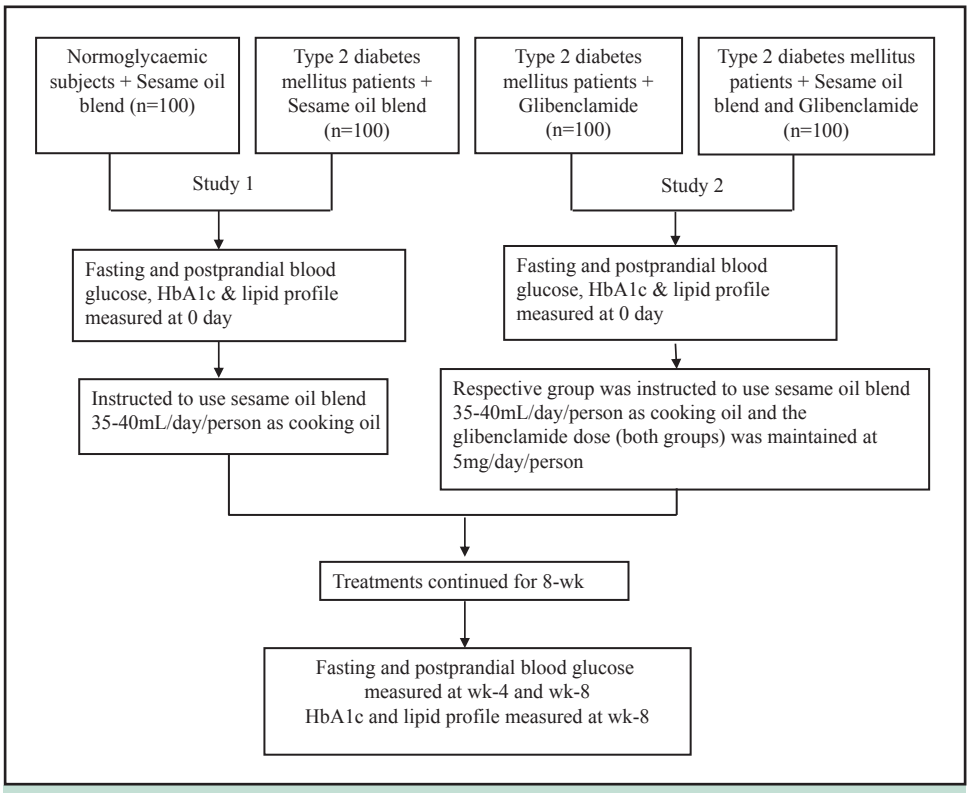

Figure 1 Study design. HbA1c = glycated hemoglobin.

that their daily use of the sesame oil blend per person/day for cooking should not exceed 35-40 mL. Type 2 diabetes mellitus patients treated with glibenclamide were asked to continue their medication for 8 weeks. Fasting and postprandial blood glucose levels were measured at week 4 and week 8, while HbA1c and TC, TG, LDL-C, non-HDL-C, and HDL-C were measured at week 8.

All participants gave an informed consent and they were told that they are free to decide whether to participate or stop the study protocol at any stage of the study period. The ethical committee of the International Institute of Stress Management and Allied Sciences, New Delhi, India approved the study protocol, and the study complied with the current revision of the Declaration of Helsinki.

Methods

Anthropometric and Biochemical Determinations. Anthropometric measurements were carried out according to the standard protocols. Plasma glucose and serum concentrations of TC and TG were measured with a Hitachi Modular Analytics D-2400 analyzer (Roche Diagnostics, Basel, Switzerland). HDL-C concentrations were determined on a heparin-manganese supernatant using a single-precipitation procedure. LDL-C concentrations were calculated by using the Friedewald formula[20] and non-HDL-C was calculated as TC−HDL-C.

Data Analyses

Data analyses were performed using the Statistical Analysis System Software Package (Ver. 9.4, SAS Institute Inc, Cary, NC) at Fukuoka University, Japan. Changes in continuous variables during the study period for each group were examined by a repeated measures analysis of variance (ANOVA). Differences in continuous variables between groups were examined by an ANOVA. Patterns of changes between groups were examined by a 2-way repeated measures ANOVA. Changes at week 8 of the study period from baseline for each group were examined by Wilcoxon signed-rank test. Differences in changes between groups at week 8 of the study period from baseline were examined by Wilcoxon rank-sum test. Data are presented as the mean ± SD, and the significance level was considered to be <0.05 unless indicated otherwise.

RESULTS

Baseline Characteristics of the Study Participants

Type 2 diabetes mellitus patients were randomly assigned to one of the 3 intervention groups, whereas the normoglycemic subjects were grouped as normal control for sesame oil blend. All participants completed the study and none was classified as noncompliant. No significant

differences were observed at baseline values for body weight, weight/height ratio, and body mass index among type 2 diabetes mellitus patients in each of the 3 intervention groups. Likewise, we found no significant differences in the baseline values for lifestyle habits of type 2 diabetes mellitus patients such as smoking, alcohol consumption, betel nut chewing, and physical activity (Table 1).

Study 1: Effect of Sesame Oil Blend on Normoglycemic Subjects vs Type 2 Diabetes Mellitus Patients

As shown in Table 2 and Figure 2, type 2 diabetes mellitus patients treated with sesame oil blend showed significant reduction of fasting and postprandial blood glucose ($P < .001$) at week 4 and week 8, whereas no significant changes were observed in normoglycemic subjects. Likewise, serum levels of TC, TG, LDL-C, and non-HDL-C levels were reduced significantly, and HDL-C levels were increased significantly in type 2 diabetes mellitus patients treated with sesame oil blend. According to the scatter plots (Figure 3), the changes in fasting and postprandial blood glucose and the lipid profile with sesame oil blend depends on baseline levels of the respective parameters; this is more pronounced among type 2 diabetes mellitus patients than normoglycemic subjects.

Study 2: Additive Effect of Sesame Oil Blend in Type 2 Diabetes Mellitus Patients Receiving Glibenclamide

As shown in Table 2 and Figure 2, the highest reduction in fasting and postprandial blood glucose ($P < .0001$) was noted at week 4 and week 8 in type 2 diabetes mellitus patients treated with a combination of glibenclamide and sesame oil blend, compared with the glibenclamide-alone-treated group. Likewise, HbA1c was highly reduced at week 8. TC, TG, LDL-C, and non-HDL-C were reduced significantly, while HDL-C levels increased significantly in the combination group only.

From the scatter plots (Figure 3), for comparable baseline fasting and postprandial blood glucose, the data indicate that the type 2 diabetes mellitus patients treated with the combination of glibenclamide and sesame oil blend showed greater reduction in blood glucose as compared with the glibenclamide-alone-treated type 2 diabetes mellitus patients.

DISCUSSION

In this open-label randomized dietary intervention, we found that using antioxidants and an unsaturated fatty acids-rich blend of 20% cold-pressed un-refined sesame oil and 80% physically refined rice bran oil (Table 3) as cooking oil for 8 weeks lowered hyperglycemia and improved the lipid profile. The study indicated that the use of the sesame oil blend had an additive effect with antidiabetic medication for the highest reduction of blood glucose, and HbA1c.

The use of sesame oil as cooking oil has been shown to increase the enzymatic and nonenzymatic antioxidants in diabetic hypertensives, as well as in patients with type 2 diabetes mellitus.[13,15,21-23] Use of sesame oil as cooking oil for 45 days reduced blood sugar and HbA1c in diabetic-hypertensive patients; these measures rose up again once the use of sesame oil was stopped for another 45 days.[13] Sesamin has been shown to have hypoglycemic and hypolipidemic activities, and ameliorates insulin resistance in KK-A^y mice.[24] These studies clearly indicated that sesamin-rich sesame oil has a definitive antihyperglycemic effect.

Table 1 Baseline Characteristics of the Study Participants

	Sesame Oil Blend			Type 2 Diabetes Mellitus Patients		
	Normal Subjects	Type 2 Diabetes Mellitus Patients		Glibenclamide (n = 100)	Glibenclamide + Sesame Oil Blend (n = 100)	
Parameters	Study 1		*P* Value	Study 2		*P* Value
Age, (Y)	32.6 ± 10.0	50.8 ± 11.0	<.001	50.6 ± 10.6	49.8 ± 10.8	.63
Sex, Male (%)	55 (55%)	46 (46%)	.2	61 (61%)	55 (55%)	.39
Body weight, kg	62.4 ± 9.6	63.3 ± 10.8	.01	68.7 ± 9.4	68.4 ± 12.3	.87
Waist:hip ratio	0.99 ± 0.04	0.98 ± 0.03	.5	0.96 ± 0.07	0.98 ± 0.11	.17
BMI, kg/m^2	23.9 ± 3.6	26.0 ± 4.5	<.001	27.0 ± 4.3	26.3 ± 4.4	.27
Smoking, n (%)	3 (3%)	4 (4%)	1	5 (5%)	11 (11%)	.19
Alcohol, n (%)	0 (0%)	0 (0%)		2 (2%)	12 (12%)	.01
Betel nut chewing, n (%)	0 (0%)	3 (3%)	.25	1 (1%)	8 (8%)	.03
Physical activity, n (%)	100 (100%)	87 (97%)	.25	71 (71%)	77 (57%)	.06

n indicates the number of subjects who had the habit of smoking, alcohol drinking, betel nut chewing, or physical activity.
BMI = body mass index.

Table 2 Changes in Blood Glucose and Serum Lipid Levels in Normoglycemic Subjects and Type 2 Diabetes Mellitus Patients Treated with Sesame Oil Blend, Type 2 Diabetes Mellitus Patients Treated with Glibenclamide Only and Type 2 Diabetes Mellitus Patients Treated with Glibenclamide in Combination with Sesame Oil Blend

	Sesame Oil Blend			Type 2 Diabetes Mellitus Patients		
Parameters	Normal Subjects (n = 100) Study 1	Type 2 Diabetes Mellitus Patients (n = 100)	Group* Period Interaction (*P* Value)	Glibenclamide (n = 100) Study 2	Glibenclamide + Sesame Oil Blend (n = 100)	Group* Period Interaction (*P* value)
Fasting plasma glucose (mg/dL)						
0 days	95 ± 8	181 ± 20†		180 ± 18	184 ± 37	
Week 4		162 ± 24*		153 ± 14*	150 ± 30*	
Week 8	93 ± 7	155 ± 21*,†	<.001	137 ± 12*	128 ± 26*,†	.04
Postprandial plasma glucose (mg/dL)						
0 days	121 ± 10	242 ± 26†		246 ± 27	248 ± 37	
Week 4		219 ± 28*		220 ± 24*	210 ± 41*,†	
Week 8	119 ± 10	189 ± 36*,†	<.001	175 ± 14*	161 ± 37*,†	.02
HbA1c (%)						
0 days	5.1 ± 0.5	7.3 ± 1.2†		7.3 ± 1.2	7.2 ± 1.4	
Week 8	5.0 ± 0.4	6.5 ± 1.0*,†	<.001	6.4 ± 1.2*	5.6 ± 0.9*,†	<.001
Total cholesterol (mg/dL)						
0 days	172 ± 14	230 ± 27†		230 ± 31	231 ± 26	
Week 8	170 ± 14	184 ± 16*,†	<.001	233 ± 29	185 ± 20*,†	<.001
Triglyceride (mg/dL)						
0 days	148 ± 8	193 ± 29†		195 ± 30	196 ± 34	
Week 8	145 ± 8	166 ± 15*,†	<.001	198 ± 39	170 ± 24*,†	<.001
HDL-C (mg/dL)						
0 days	49 ± 5.5	45.1 ± 4.5†		44.8 ± 3.9	45.1 ± 5.6	
Week 8	49.4 ± 5.3	50.9 ± 5.1*	<.001	44.4 ± 3.9	52.2 ± 6.5*,†	<.001
LDL-C (mg/dL)						
0 days	94 ± 15	147 ± 28†		146 ± 31	147 ± 27	
Week 8	92 ± 15	100 ± 16*,†	<.001	149 ± 30	99 ± 20*,†	<.001
Non-HDL-C (mg/dL)						
0 days	123 ± 16	185 ± 28†		186 ± 31	186 ± 26	
Week 8	121 ± 15	133 ± 16*,†	<.001	189 ± 29	133 ± 21*,†	<.001

HDL-C = high-density lipoprotein cholesterol; LDL-C = low-density lipoprotein cholesterol.
*P <.05, changes during the study period, assessed by a repeated measures analysis of variance.
†P <.05, differences between groups, assessed by an analysis of variance.

A recent study has reported that long-term supplementation of rice bran oil in diabetic rats reduced the oxidative stress in addition to the improved regenerative changes in pancreas.[25] Rice bran oil diet over a period of 5 weeks showed improvement in lipid abnormalities, reduced the atherogenic index, and suppressed the hyperinsulinemic response in diabetic rats.[17] γ-Oryzanol, which is the most notable component of rice bran oil,[26] has been shown to ameliorate insulin resistance and hyperlipidemia in rats with type 2 diabetes.[19] Kozuka et al[27] reported that γ-oryzanol acts as a chemical chaperone and decreases high-fat-diet-induced endoplasmic reticulum stress in the hypothalamus, leading to a significant shift in preference from fatty to healthy foods. Gamma-oryzanol also decreases high-fat-diet-induced endoplasmic reticulum stress in pancreatic β cells and improves β-cell dysfunction. Furthermore, γ-oryzanol directly acts on pancreatic islets and enhances glucose-stimulated insulin secretion.[27] It has been reported that γ-oryzanol is more effective than ferulic acid in inhibiting the hepatic fat accumulation and inflammation and therefore could be used as a dietary supplement to alleviate the deleterious effects of high-fat/high-fructose diets.[28] Earlier study has suggested that diets with high n-6 polyunsaturated fatty acids may improve insulin sensitivity.[29] Sesame oil blend is rich in n-6 polyunsaturated fatty acids, which may be an additive for the improvement of hyperglycemia besides sesame lignans and γ-oryzanol.

Studies have reported that the use of sesame oil lowered TC, TG, LDL-C, and improved HDL-C in humans.[13,15,21-23] The data from a recent study indicated that an atherogenic diet reformulated with sesame oil showed antiatherosclerotic and antiinflammatory actions by reducing the atherosclerotic lesions, plasma cholesterol, TG and LDL-C levels, and plasma inflammatory cytokines in lipoprotein receptor knock-out mice.[30] Helli et al[31] demonstrated that consumption of sesamin reduced the body weight, blood pressure, and lipid profile in women suffering with rheumatoid arthritis. Other studies have also reported that dietary sesamin reduced the

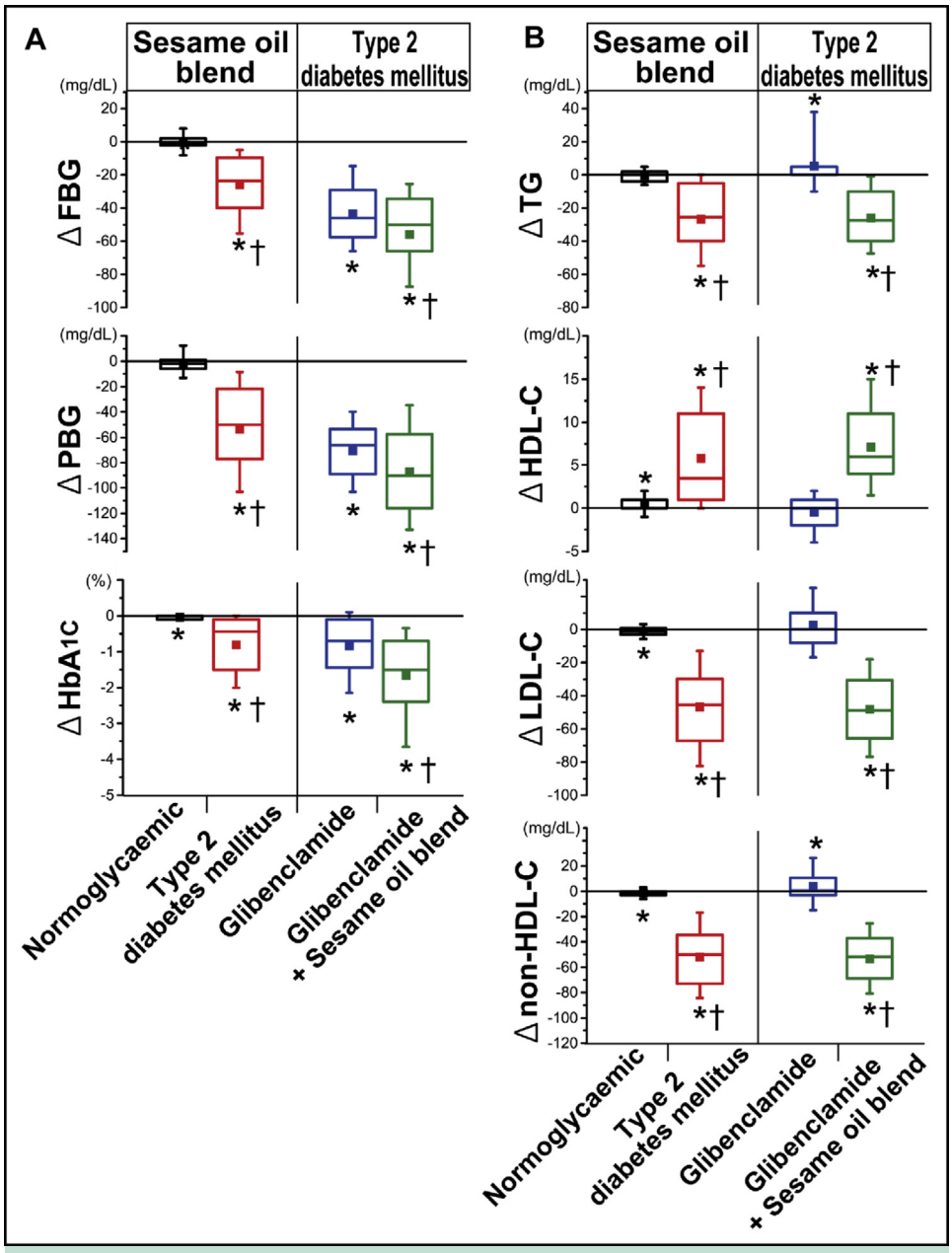

Figure 2 Box-and-whisker plots showing the mean (■), median (middle bar in the rectangle), and 10th (bottom bar), 25th (bottom of rectangle), 75th (top of rectangle), and 90th (top bar) percentiles of changes in fasting (FBG) and postprandial blood glucose (PBG), and glycated hemoglobin (HbA1c) (**A**) and serum lipids (**B**) in normoglycemic subjects and type 2 diabetes mellitus patients treated with sesame oil blend (left panel) and type 2 diabetes mellitus patients who were treated with glibenclamide with and without receiving sesame oil blend (right panel) at baseline and week 8 of the study. *P <.05, within-group changes (week 8 vs baseline), assessed by Wilcoxon signed-rank test. †P <.05, changes between groups (type 2 diabetes mellitus patients vs normoglycemic subjects who received sesame oil blend or glibenclamide-treated patients with type 2 diabetes mellitus who received and did not receive sesame oil blend), assessed by Wilcoxon rank sum test. HDL-C = high-density lipoprotein cholesterol; LDL-C = low-density lipoprotein cholesterol; TG = triglycerides.

plasma TC accompanied by increased excretion of total fecal neutral and acidic steroids and downregulated mRNA of intestinal NPC1L1, ACAT-2, MTP, ABCG5, and ABCG8, all of which are considered vital factors for cholesterol absorption in the intestine.[32] With regard to the cholesterol-lowering efficacy of sesamin, it has been reported that sesamin downregulated the activity and gene expression of 3-hydroxy-3-methyl-glutaryl-CoA (HMG-CoA) reductase.[33,34] The

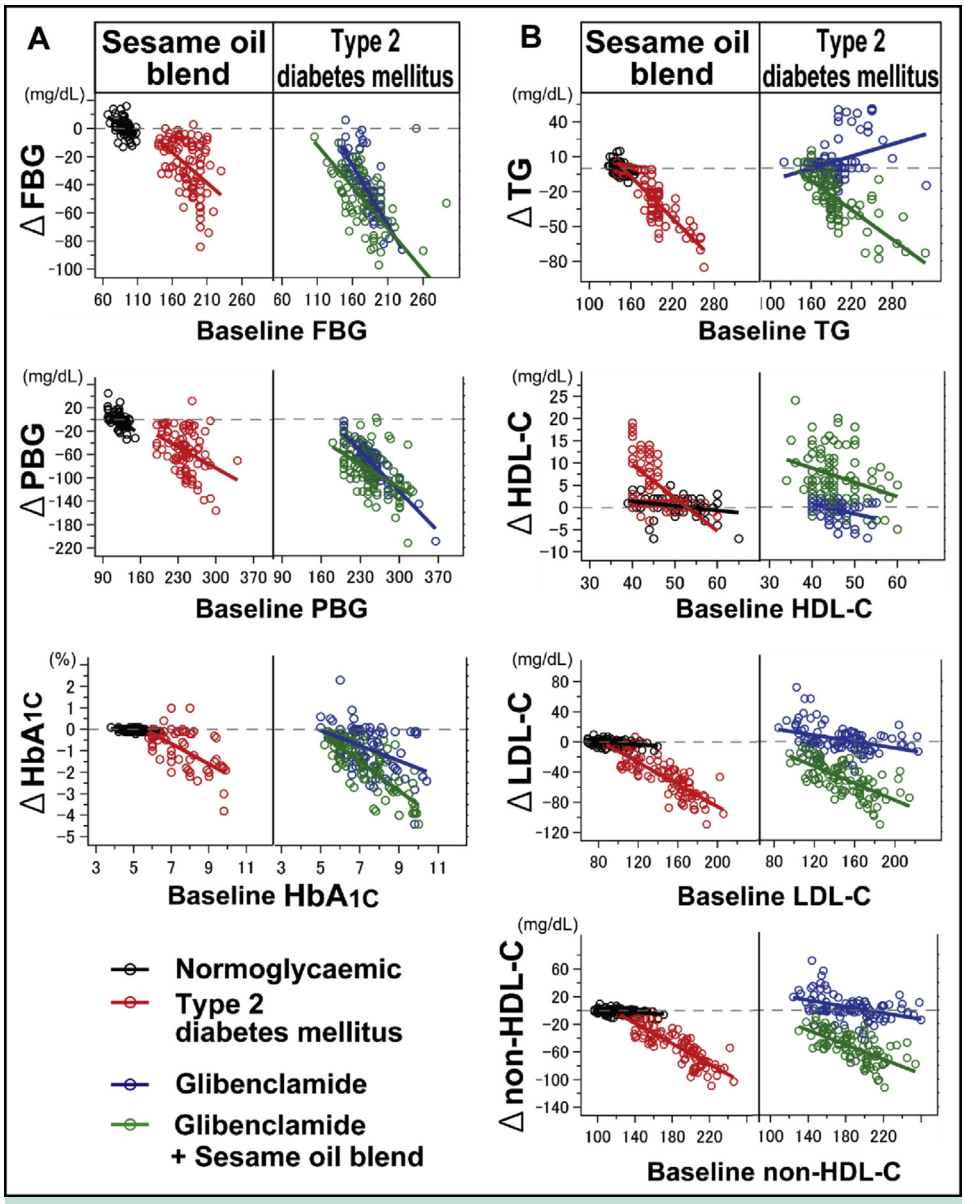

Figure 3 Dependence of the effects of sesame oil blend on fasting (FBG) and postprandial (PBG) blood glucose, and glycated hemoglobin (HbA1c) (**A**) and serum lipids and lipoproteins (**B**) on their baseline levels in normoglycemic subjects, type 2 diabetes mellitus patients with and without sesame oil blend treatment. (**A**) Scatter plot of changes (Δ) in FBG vs baseline FBG, ΔPBG vs baseline PBG, and ΔHbA1c vs baseline HbA1c in normoglycemic subjects (in black color) and type 2 diabetes mellitus patients (in red color) (left panel) and type 2 diabetes mellitus patients with (in green color) and without (in blue color) sesame oil blend treatment (right panel). (**B**) Scatter plot of changes (Δ) in triglycerides (TG) vs baseline TG, Δhigh-density lipoprotein cholesterol (ΔHDL-C) vs baseline HDL-C, and Δlow-density lipoprotein cholesterol (ΔLDL-C) vs baseline LDL-C, and Δnon-HDL-C vs baseline non-HDL-C in normoglycemic subjects (in black color) and type 2 diabetes mellitus patients (in red color) (left panel) and type 2 diabetes mellitus patients with (in green color) and without (in blue color) sesame oil blend treatment (right panel). (Color illustration appears online.)

sesame oil blend used in our study is rich in sesamin, which could be a possible resource for the effective improvement of lipid profile in addition to the rich array of unsaturated fatty acids and other unsaponifiable components of rice bran oil.

Several studies have reported that the use of rice bran oil as dietary oil reduced cholesterol and TG,[35-38] and the lipid-lowering effects of rice bran oil were attributed to the richness of γ-oryzanol and γ-tocotrienols. It has also been reported that hypocholesterolemic activity of γ-oryzanol is

Table 3 Fatty Acids and Antioxidants Concentrations of Sesame Oil and Rice Bran Oil Blend

Fatty Acids & Antioxidants Composition (%)	Sesame Oil	Rice Bran Oil	Sesame Oil and Rice Bran Oil Blend
SFA			
Palmitic acid	9.31	20.08	17.92
Stearic acid	5.43	2.41	3.01
Arachidonic acid	0.66	0.52	0.52
MUFA			
Oleic acid	42.91	42.98	42.97
PUFA			
Linoleic acid	41.28	33.63	35.56
Linolenic acid	0.44	0.39	0.4
Antioxidants			
Sesame lignans (%)	1.5	—	0.3
Oryzanol (%)	—	1	0.8
Tocopherols (mg/100 g)	50	50	50

MUFA = monounsaturated fatty acids; PUFA = polyunsaturated fatty acids; SFA = saturated fatty acids.

via decreasing cholesterol absorption in the intestine and increasing the fecal cholesterol excretion.[39] Mäkynen et al[40] suggested that the hypercholesterolemic effect of γ-oryzanol is perhaps due, in part, to the impaired apical uptake of cholesterol into enterocytes and a decrease in HMG-CoA reductase activity in mammalian cells. It is reported that γ-tocotrienol regulates cholesterol synthesis by influencing the mevalonate pathway in mammalian cells and by downregulating the HMG-CoA reductase followed by a decreased liver TC, plasma TC, and LDL-C levels.[41] The richness of unsaturated fatty acids in the sesame oil blend, γ-oryzanol and γ-tocotrienol contents of rice bran oil, in part with sesame lignans, may have a synergistic effect on lowering TC, TG, LDL-C, and improving the HDL-C levels in our study. Reduction of dietary intake of saturated fatty acids appears to be the key to reducing the risk of atherosclerosis in humans.[42] Earlier study also observed that diet rich in unsaturated fatty acids reduced TC, TG, and LDL-C, as compared with diets containing saturated fatty acids[43,44] in clinical trials and in animal models.[45-47] The data from our study provide further support to the epidemiological evidence, which suggests that mono- and polyunsaturated fatty acids-enriched diets confer a beneficial effect by decreasing the risk of degenerative diseases, primarily coronary heart diseases and type 2 diabetes mellitus.

Although the use of a blend of sesame oil and rice bran oil showed favorable impact on managing type 2 diabetes mellitus and associated cardiovascular risk factors, the study had some limitations. Firstly, the study is an open-label randomized and not placebo or crossover design. Secondly, the background diets of the type 2 diabetes mellitus patients and normoglycemic subjects, and the amount of sesame oil blend consumed by each participant, were not monitored during the study. Thirdly, our study was done in type 2 diabetes mellitus patients of an urbanized Indian population, possibly limiting the generalizability of these findings to other socioeconomic or ethnic groups. Additional studies are therefore needed in other ethnic groups and people with lower socioeconomic status to confirm the current findings. However, the sesame oil blend is all natural, and may indeed be generalizable to other ethnic groups. There were no side effects with the use of sesame oil blend reported by the participants during the study, and it was well accepted by them as regular cooking oil. In our study, the body weight changes upon the use of sesame oil blend were not monitored during the study. Perhaps a change in body weight may account for the improvements observed in this study; that needs to be determined.

In conclusion, use of sesame oil blend as a cooking medium showed notably beneficial effects on glycemic control and lipids in patients with type 2 diabetes mellitus. Moreover, the combination of sesame oil blend and glibenclamide treatment in these patients produced highly significant improvement of hyperglycemia. These findings could be of clinical relevance for the development of prevention strategies in the population at risk for type 2 diabetes mellitus and future cardiovascular risk.

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