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Original Research Article

Effect of Yoga and Meditation on Lipid Profile Antioxidant Status in Diabetic and Hypertensive Patients

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Conflict of interest: Nil

Abstract:

Introduction: Diabetes mellitus is a chronic, metabolic disorder characterized by hyperglycemia. The overwhelming increase of obesity is the first cause of Diabetes which is closely linked to the insulin resistance and associated with hypertension along with dyslipidemia, stress and altered antioxidant level. Yoga and meditation have beneficial effect in diabetic and hypertensive patients. Hence, the aim of this study is to assess the effect of yoga and meditation on lipid profile and antioxidant status in patients with Diabetes mellitus and Hypertension.

Material and Method: This Prospective study, done at MGM Medical college ,Mumbai , include 60 healthy control subjects and patients with Diabetes mellitus and diabetes with hypertension , enrolled from both MGM hospital kamothe, Navi Mumbai and International Sahaja which Yoga Meditation and Research centre ,Mumbai. After overnight fast, blood samples was collected from each subject by venipuncture with standard blood collection technique in a plain vial for the analysis of lipid profile and MDA, SOD and Nitric oxide. The Blood pressure (systolic/diastolic) was measured by Sphygmomanomete.

Result: The concentration of MDA, Triacylglycerol (TG), Cholesterol and LDL-cholesterol were decreased significantly in diabetics and diabetic hypertensive subjects as well as in healthy individuals after Sahaja yoga meditation over a period of six month. The HDL-cholesterol, SOD, Nitric oxide concentration were increased significantly in healthy individuals as well as in diabetics and diabetic hypertensive subjects participated in Sahaja yoga meditation.

Conclusion: This study confirms the health promoting effects of yoga meditation on lipid profile and antioxidant status in type 2 diabetic and diabetics with hypertensive patients over a period of six month, so it may be included as part of treatment regimen along with regular medication in patients of Diabetes with hypertension to improve the quality of life and to prevent the complications of diabetes.

Keywords: Diabetes Mellitus and Hypertension, Antioxidant status, Yoga Meditation, Lipid profile.

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Introduction

Type 2 Diabetes is characterized by insulin resistance, impaired insulin secretion, hyperglycemia and other metabolic abnormalities [1,2]. It is a slow progressive disease, affecting most of the systems in the body and perpetually deteriorating their normal function [3].

Diabetic patients suffer from numerous microvascular and macrovascular complications which cause a lot of morbidity and mortality [4]. Obesity, insulin resistance and glucose intolerance may be accompanied by dyslipidemia and by arterial hypertension [5]. Dyslipidemias in diabetes is characterized by elevated triglycerides and cholesterol level, low high density lipoprotein (HDL) cholesterol levels, and increased low density lipoprotein (LDL) [6]. Type 2 diabetic subjects have an increased preponderance of small dense low-density lipoprotein (LDL), which predisposes to the oxidation of LDL [7]. Lipid abnormalities significantly contribute to the increased risk of cardiovascular disease and hypertension. [8,9].

Oxidative stress plays a major role in the pathogenesis of type 2 diabetes mellitus [10]. In type 2 Diabetes mellitus, there is increased oxidative stress because of the prolonged exposure to hyperglycemia due to the improper utilization of blood sugar by the tissues which induces the overproduction of oxygen free radicals and consequently increases the protein oxidation and lipid peroxidation [11,12]. This resulted in an increase in free radical production and insufficient Antioxidants (Superoxide dismutase) in the body [5,13]. Hyperglycemia also leads to glycation and inactivation of superoxide dismutase followed by insufficient production of antioxidants (Superoxide dismutase) in the body [13,14]. Products of membrane lipid peroxidation and other oxidants like H2O2 may react with superoxide dismutase resulting in oxidative modification thereby causing loss of enzyme activity [14]. Increased oxidative stress leads to endothelial dysfunction and decreased Nitric oxide synthesis. The decreased amount of Nitric oxide will give rise to fewer amounts of nitrite and nitrate and leads to increased vascular resistance progressing to atherogenesis [11]. Oxidative stress generally causes damage to the membrane polyunsaturated fatty acid leading to the generation of MDA, a lipid peroxidation product and a marker of oxidative stress. Its concentration is elevated in poorly controlled type 2 diabetic patients [10]. Mechanisms that contribute to increased lipid peroxide formation in diabetic patients include: hyperglycaemic-induced glucose auto-oxidation, non-enzymatic glycation of proteins and lipids, increased sorbitol pathway activity and oxidation of advanced glycation end-products (AGEs). A variety of natural antioxidants exist to scavenge oxygen free radicals and prevent oxidative damage to biological membranes. One group of these antioxidants is enzymatic (intracellular), which includes superoxide dismutase (SOD), glutathione peroxidase and catalase. Abnormally high levels of peroxidation and the simultaneous decline of antioxidant defense mechanisms can lead to damage of cellular organelles and oxidative stress in diabetes [15]. Arterial hypertension is common in patients with type 2 diabetes [16]. The incidence of hypertension in NIDDM is related to the degree of obesity, advanced age, and extensive atherosclerosis that is typically present [17].

Yoga is an ancient discipline designed to bring balance and health to the physical, mental, emotional, and spiritual dimensions of the individual [14]. The purpose of yoga is to lead to a silence of the mind through the process of Meditation. Meditation is a state of 'mental silence' characterized by the elimination of unnecessary thought, effortless attention on the present moment and alert awareness [18]. Yoga meditation as described in this study is Sahaja Yoga meditation (SY), the yoga of the Divine Energy within Man [19]. Sahaja Yoga meditation is a simple and accessible meditation technique which has been found to have long lasting, positive, physiological and psychological effects upon people of all age groups [20]. It works by balancing the energy of the body on a subtle level and connecting the individual with the universal living consciousness. It has been found that, with the regular practice of Sahaja yoga meditation; there is a general improvement, in one's physical, mental, emotional and spiritual well-being [19].

It is well established that good glycemic control and control of other cardiovascular risks in diabetic and hypertensive patients lead to reduced morbidity and mortality [21]. Yoga and meditation have found to be beneficial in diabetic and hypertensive patients [18]. Yogic practices have been found to be most useful in alleviating stress-induced disorders such as hypertension, diabetes by improvement in lipid and carbohydrate metabolism [22]. The regular practice of yoga and meditation has shown to improve the serum lipid profile in the diabetic patients as well as in healthy individuals8. Yoga and meditation enhanced antioxidant defense mechanism in diabetics by reducing oxidative stress and free radicals. This results in a significant higher level of serum nitric oxide and Superoxide dismutase and a significant reduced level of serum malondialdehyde (MDA) [15,23,24]. Yoga significantly regulates heart rate and systolic and diastolic blood pressures and it has proven efficacy in managing secondary cardiac complications due to chronic hypertension. [8,18]. There is a significant decrease in the free fatty acids, LDL and VLDL cholesterol, with increase in HDL cholesterol after yoga and meditation8. The possible mechanisms of the yogic practices are: Direct influence on pancreatic secretion by rejuvenation of the pancreatic cells, through alternate abdominal contractions and relaxation and reduction in blood sugar due to muscular exercise involved during yoga and meditation [14]. Hence, the aim of this study is to assess the effect of yoga and meditation on lipid profile and antioxidant status in patients with Diabetes mellitus and Hypertension.

Material and Method

The aim of this study is to assess the effect of yoga and meditation on lipid profile and antioxidant status in patients with Diabetes mellitus and Hypertension. The primary objectives of present study are to assess the level of oxidative stress markers such as malondialdehyde (MDA), enzymatic antioxidant like superoxide dismutase (SOD), nitric oxide (NO) and lipid profile levels in patients with diabetes mellitus and diabetes with hypertension and in healthy control subjects before and after yoga and meditation over a period of six

month. The secondary objectives of present study are to understand the Antioxidant status by correlation of MDA with nitric oxide and total cholesterol in each group and to understand the effect of yoga and meditation in diabetic and diabetic with hypertensive subjects. This Prospective study, done at MGM Medical college, Mumbai, include 60 healthy control subjects and patients with Diabetes mellitus and diabetes with hypertension , enrolled from both MGM hospital kamothe, Navi Mumbai and International Sahaja which Yoga Meditation and Research centre ,Mumbai. All questionnaires and Investigations which are mentioned were done at MGM Medical College. All patients enrolled were willing and able to give consent, and also willing and able to comply with study protocol. After overnight fast, blood samples was collected from each subject by venipuncture with standard blood collection technique in a plain vial for the analysis of lipid profile i.e. total cholesterol (TC), triglycerides (TG), HDL cholesterol, LDL- cholesterol and VLDL-cholesterol) and MDA, SOD and Nitric oxide. The LDL cholesterol and VLDL cholesterol were calculated by using the Fried Wald's formulae. The Blood pressure (systolic/diastolic) was measured by Sphygmomanometer. All Investigations were done by standard protocol.

Result and Discussion:

The present study addressed the effect of Sahaja yoga meditation on patients with type II diabetes and diabetes with hypertensive patients (in addition to their regular treatment). Sahaja yoga and meditation have positive effect on biochemical parameters and antioxidant status in type-2 diabetes and diabetics with hypertensive patients. In the present study serum Total cholesterol, triglycerides, LDL- cholesterol, HDL- cholesterol and VLDL-cholesterol concentrations and Malondialdehyde (MDA), nitric oxide (NO) and superoxide dismutase (SOD) activities were measured. In the study undertaken it was found that, levels of antioxidants like nitric oxide, superoxide dismutase (SOD) and HDL-cholesterol activities in diabetic and hypertensive patients, who were undergoing sahaja yoga meditation, were significantly improved as compared to the diabetic with hypertensive patients, who were not undergoing sahaja yoga meditation. The levels of these antioxidants gradually increased after sahaja yoga meditation in healthy and diabetic with hypertensive subjects showing a state of improved health. The level of MDA, a marker of lipid peroxidation was decreased in healthy as well as in diabetic with hypertensive individuals after sahaja yoga meditation. It was also found that lipid profile of diabetic with hypertensive patients after sahaja yoga meditation is improved. We also correlated the MDA with NO and total cholesterol .In both groups, the correlation of NO and MDA shows that the concentration of MDA is decreased with increased level of NO. The correlation of MDA with total cholesterol confirms that MDA level is decreased along with cholesterol concentration in diabetics and diabetic hypertensive subjects participated in Sahaja yoga meditation. The Blood pressure of the healthy as well diabetics and diabetic with hypertensive individuals was also controlled.

Table 1: Comparison of healthy Control and Diabetics (with and without yoga)

Parameter	Mean±SD				P- Value	
	Control without yoga	Control with yoga	Diabetic without yoga	Diabetic with yoga	Control group	Diabetic group
Triglyceride (mg/dl)	132.33±30.86	110.26±32.66	214.86±71.6	132.46±38.05	0.067	0.0005***
Cholesterol(mg/dl)	161.4±28.99	145±13.76	205.4±30.09	176.2±34.37	0.057	0.0196*
HDL(mg/dl)	45.37±5.48	57.66±5.42	31.67±4.73	43.98±3.35	0.0001***	0.0001***
LDL(mg/dl)	99.18±19.36	60.30±14.24	149.18±27.13	100.12±23.60	0.0001***	0.0001***
VLDL(mg/dl)	27.17±27.16	22.26±7.89	42.97±22.1	26.28±7.84	0.165	0.01*
NO (µmol/L)	78.33±19.17	115±28.03	32.5±21.02	86.66±26.08	0.0003***	0.0001***
SOD(Unit/ml)	1.74±0.329	2.048±0.567	0.723±0.66	1.962±0.51	0.079	0.0001***
MDA(nmol/ml)	2.76±1.066	1.96±0.545	4.45±0.69	3.17±0.622	0.0148*	0.0001***
SBP(mmHg)	118.5±3.24	110.13±6.25	137.6±10.11	122.9±8.2	0.0001***	0.0001***
DBP(mmHg)	83.06±3.69	79.2±4.82	90.9±7.7	84.26±4.77	0.0202*	0.0083**

P<0.01=significant*, P<0.001=very significant ,P<0.0001=extremely significant*****

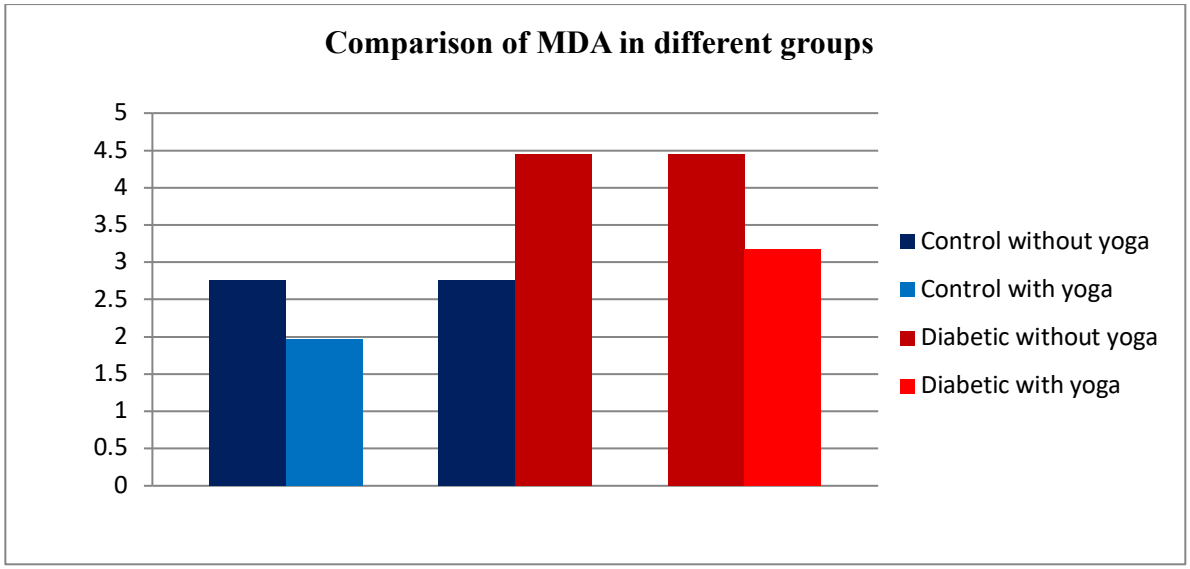

Figure 1: Comparison of MDA in different groups

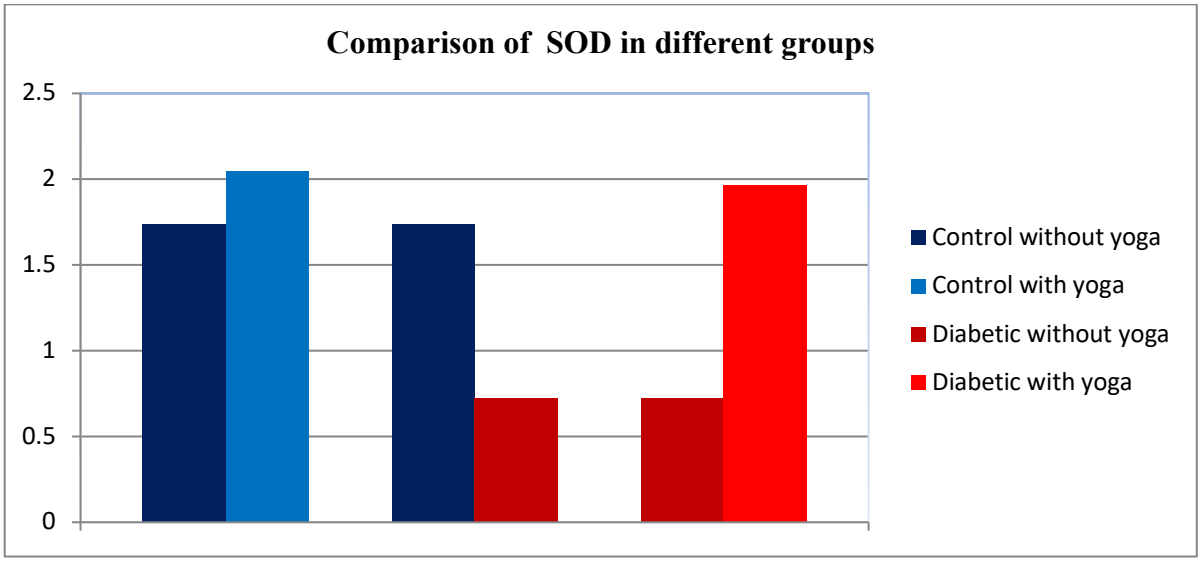

Figure 2: Comparison of SOD in different groups

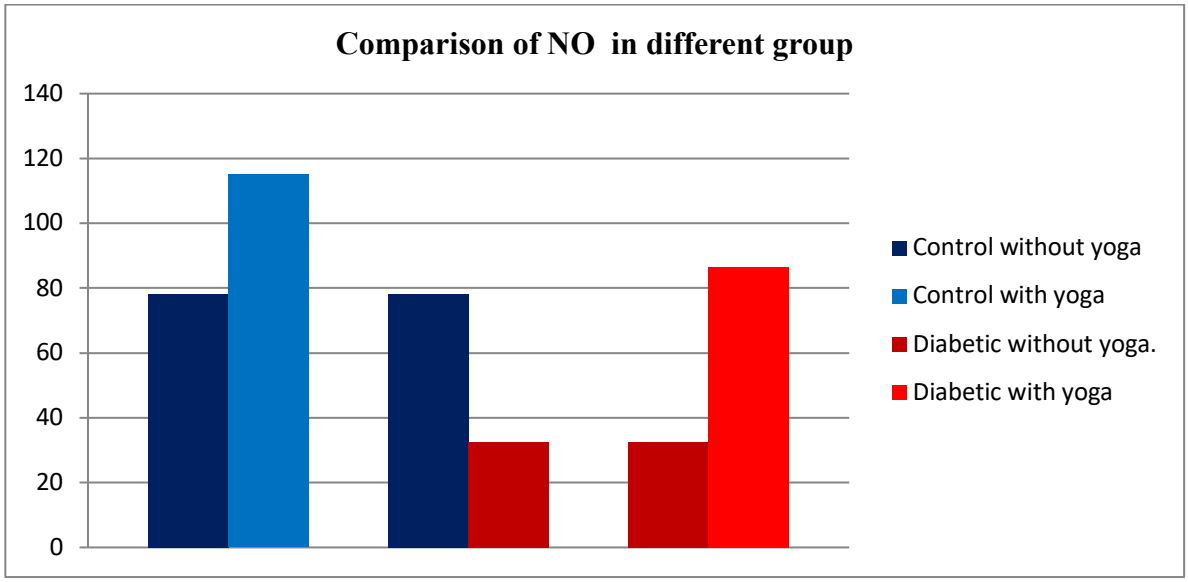

Figure 3: Comparison of NO in different group

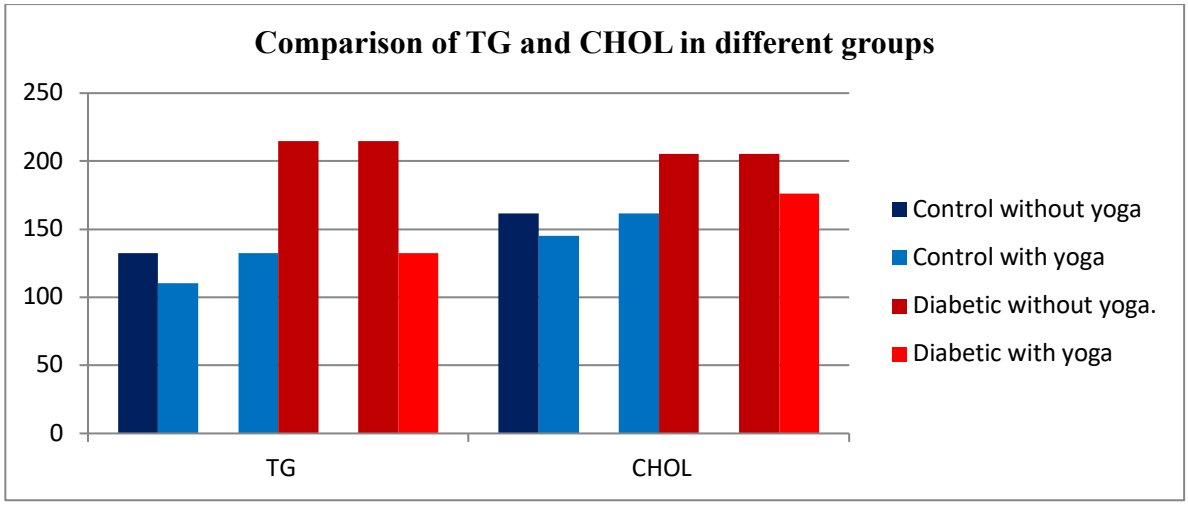

Figure 4: Comparison of TG and CHOL in different groups

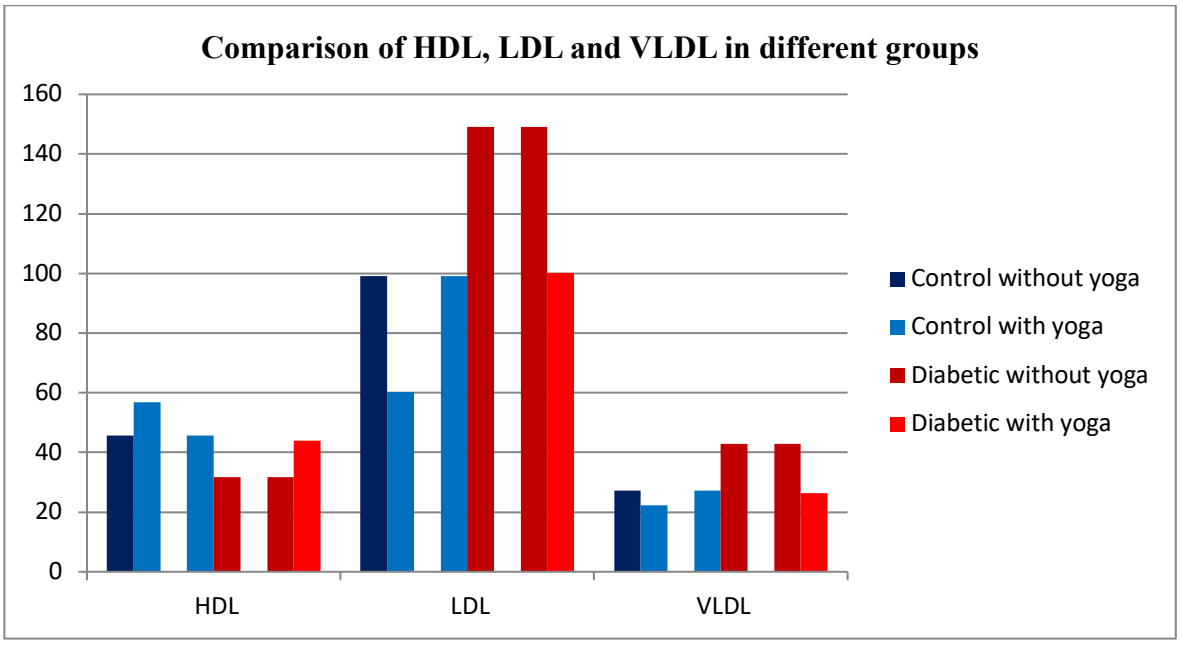

Figure 5: Comparison of HDL, LDL and VLDL in different groups

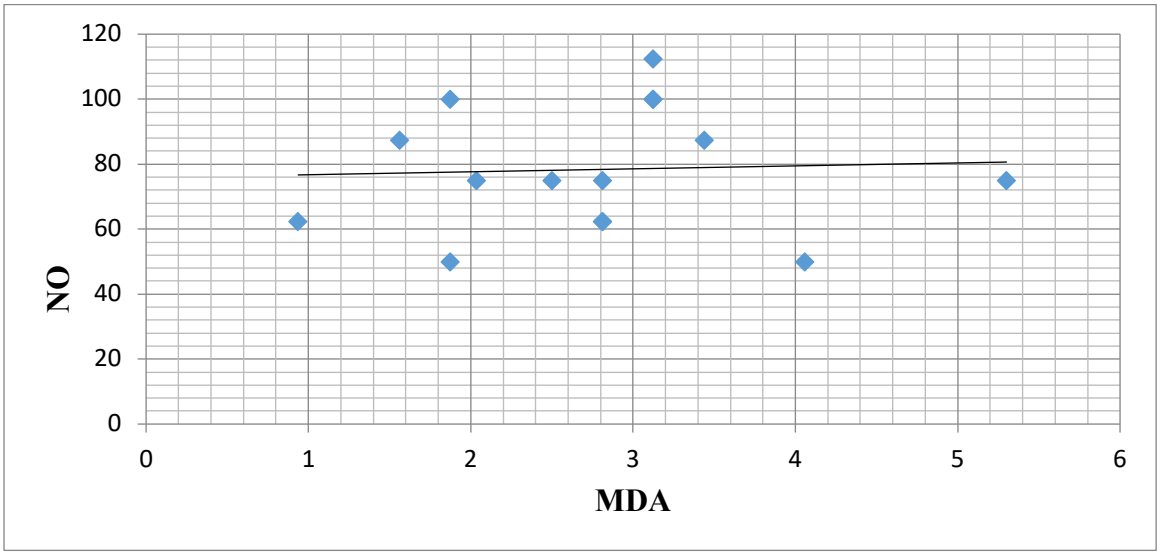

Figure 6: Correlation of MDA with NO in Healthy control (without yoga)

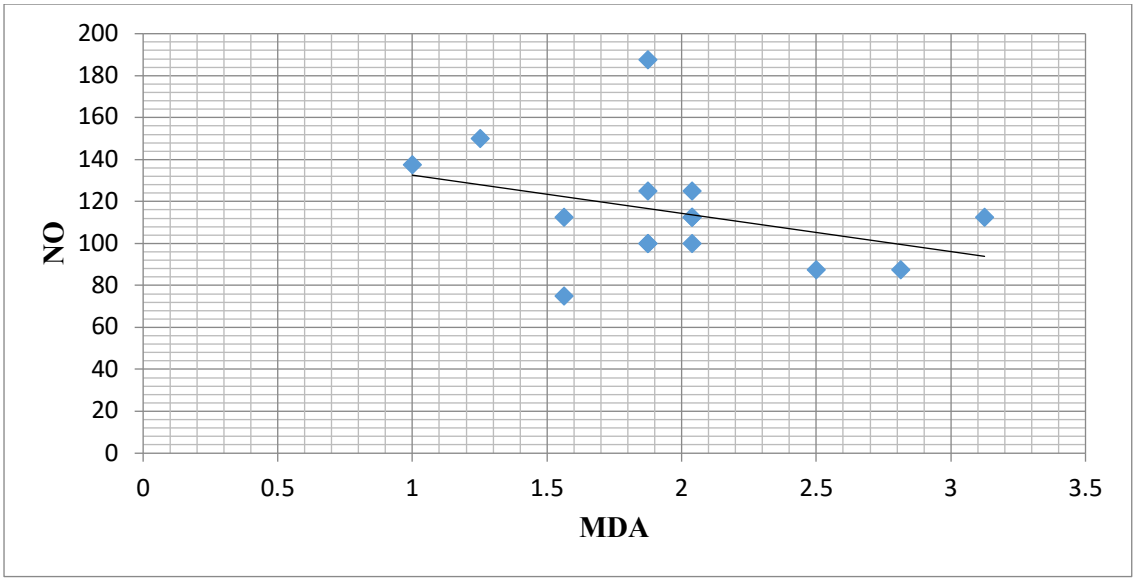

Figure 7: Correlation of MDA with NO in Healthy control (with yoga)

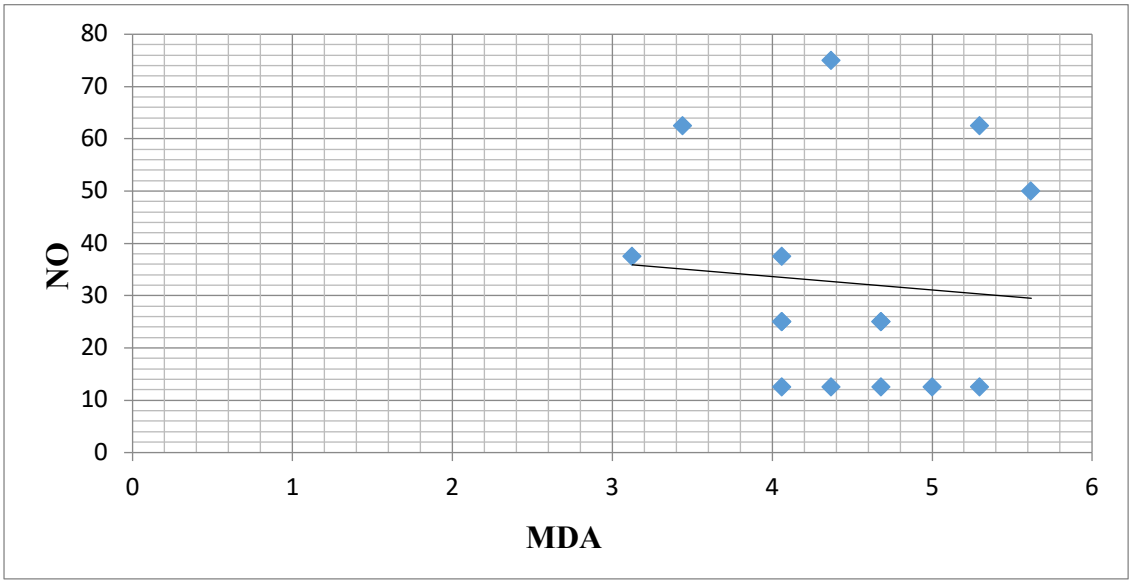

Figure 8: Correlation of MDA with NO in Diabetics (without yoga)

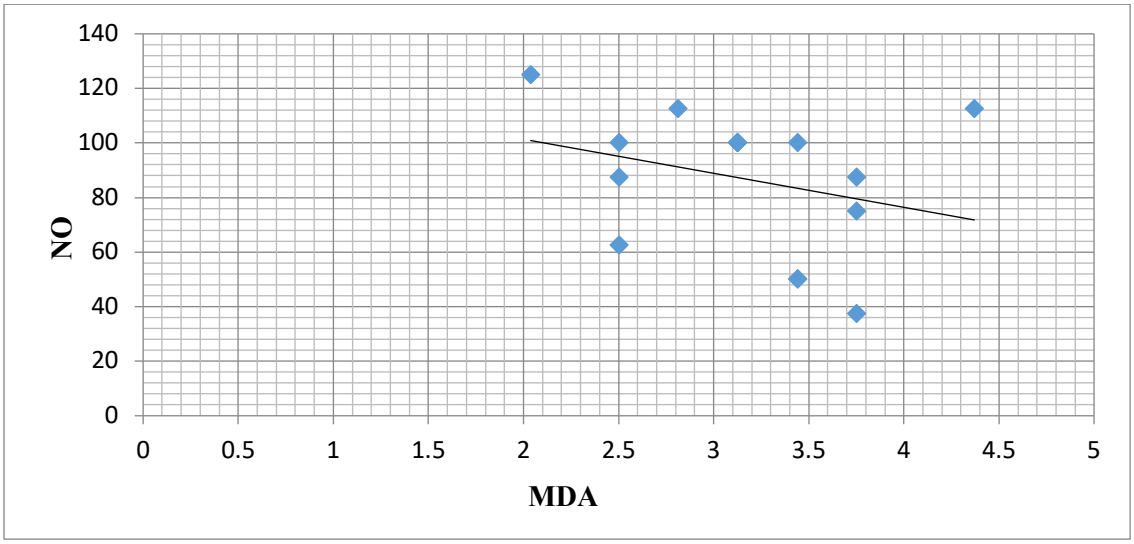

Figure 9: Correlation of MDA with NO in Diabetics (yoga)

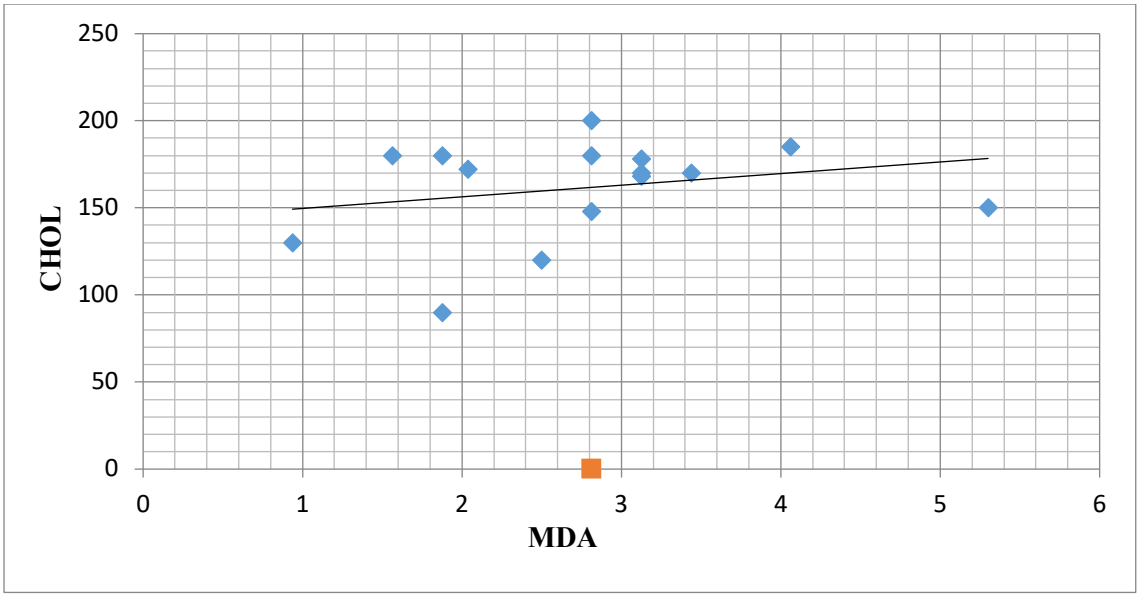

Figure 10: Correlation of MDA with Cholesterol in Healthy control (without yoga)

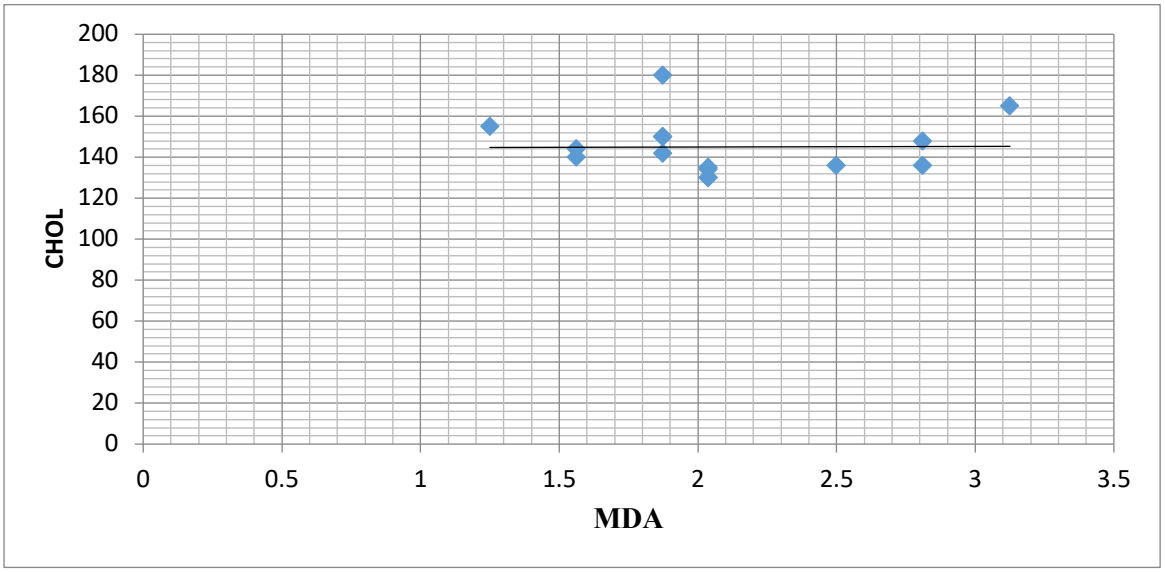

Figure 11: Correlation of MDA with cholesterol in Healthy control (with yoga)

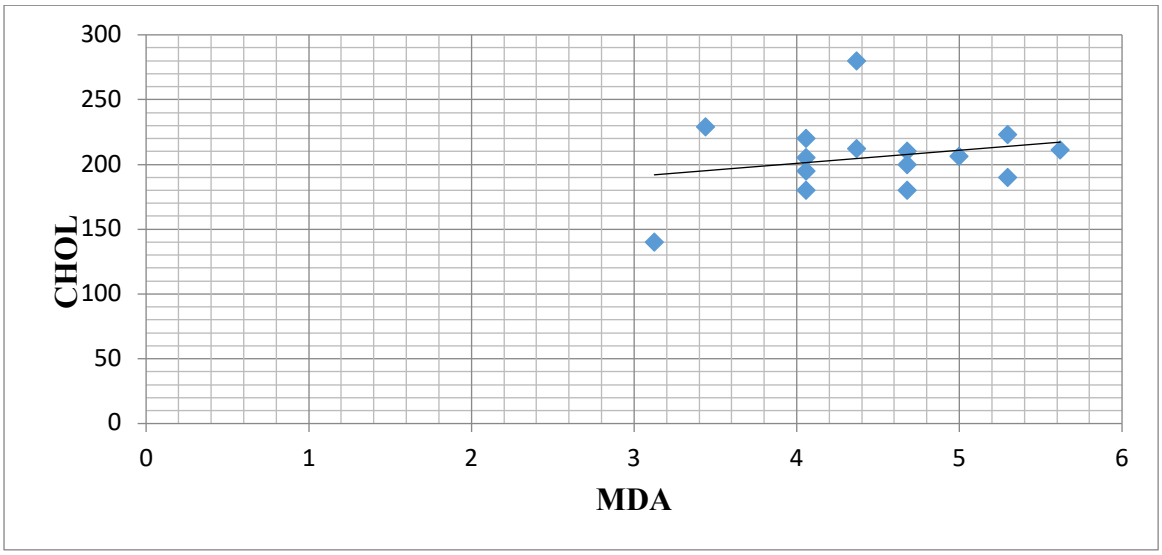

Figure 12: Correlation of MDA with Cholesterol in Diabetics (without yoga)

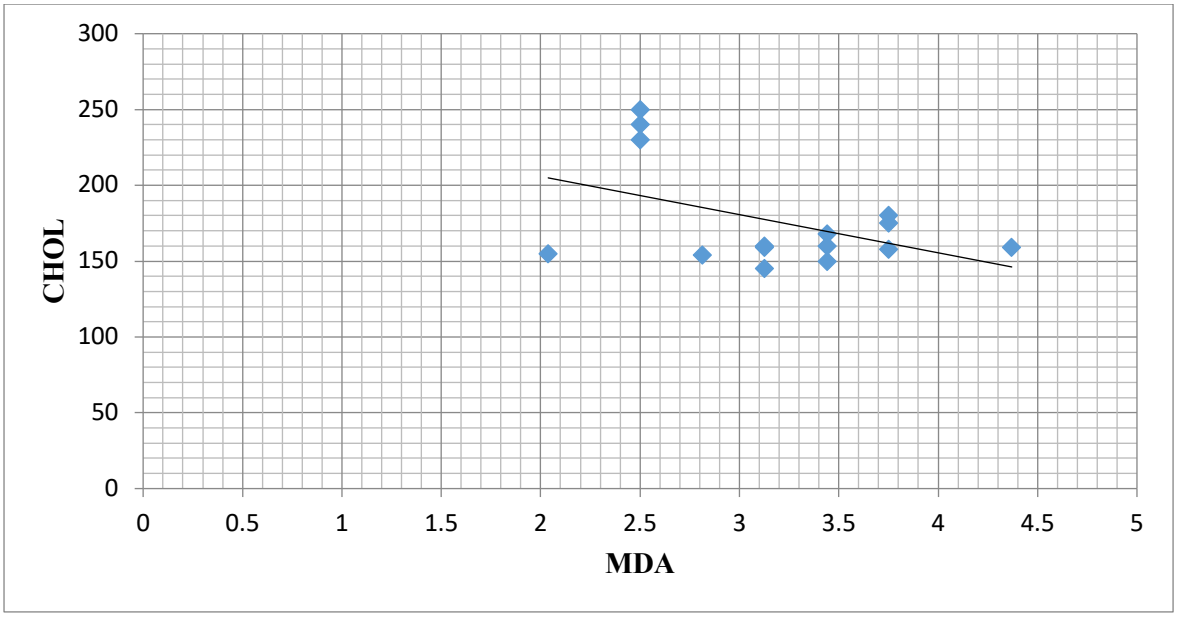

Figure 13: Correlation of MDA with cholesterol in Diabetics (yoga)

Thus, this study confirms the health promoting effects of Sahaja yoga meditation on lipid profile and antioxidant status in type 2 diabetic and diabetics with hypertensive patients over a period of six months.

Conclusion

So, we can conclude that Sahaja yoga meditation may be included as part of treatment regimen along with regular medication in patients of Diabetes with hypertension to reduce the mortality caused by associated complications of diabetes ,to prevent the complications of diabetes and improve the quality of life.

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