



## THE EFFECT OF PRANAYAMA PRACTICE REDUCES DYSLIPIDEMIA IN TYPE 2 DIABETES MELLITUS SUBJECTS: A PILOT STUDY

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### ABSTRACT

**Objective:** Hypothesis of the present study is, whether yoga practice Pranayama has an effect on Total Cholesterol (TC), Triacylglycerols (TAG), High Density Lipoprotein (HDL), and Low Density Lipoprotein (LDL) variables in Type 2 Diabetes Mellitus (T2DM) subjects. **Materials & Methods:** Forty three T2DM subjects on treatment were included in T2DM group. **Results:** Significant difference was observed in TC and TAG levels of T2DM subjects after Pranayama when compared with before Pranayama TC and TAG levels respectively. On the contrary, no significant differences were observed in HDL, LDL, and VLDL levels in T2DM patients compared within the group i.e. before and after Pranayama. **Conclusion:** The present study had demonstrated the efficacy of Pranayama on blood lipid profiles in T2DM subjects. Physical activity along with practices like Pranayama could be helpful in individuals affected with T2DM.

**KEYWORDS :** Type 2 diabetes mellitus, Pranayama, Total Cholesterol

### INTRODUCTION:

Diabetes mellitus is a complex low grade inflammatory metabolic disorder either characterized by insufficient amounts of insulin, or in which tissues fail to respond appropriately to insulin, which leads to hyperglycemia [1]. The prevalence of diabetes in India has remained at 11.8% in the last four years, according to the National Diabetes and Diabetic Retinopathy Survey report released by the health and family welfare ministry [2]. The survey conducted during 2015-2019 by registries also showed that the prevalence of known diabetes cases was 8.0% and new diabetes cases were 3.8% [3]. Males showed a similar prevalence of diabetes (12%) as females (11.7%) [4]. Goa state has found to be harboring highest rate of diabetics, followed by Andaman & Nicobar Islands in India [5]. Cardiovascular disease is a major contributor to all-cause mortality in diabetes, the biological predictors of cardiovascular disease, such as hypertension, dyslipidemia, and current smoking, to be associated with both all-cause and cardiovascular mortality [1].

Several measures have been taken to slow down the progression of the diabetic complications including alteration of lipid profile. One of the main goals of treating Type 2 Diabetes mellitus (T2DM) complications is to bring down the cholesterol level to near normal to prevent the development of diabetic complications. Though the medications of diabetes mellitus do a remarkable job in lowering lipid levels [6], however, they do not halt or delay the progress of complications. Studies have shown that even after controlling cholesterol, the macrovascular complications develop. It is also demonstrated from the studies that controlling dyslipidemia reduces diabetic complications [7]. Alarming, failure of statin drugs in lowering of lipid profile has increased the want of novel methods to treat dyslipidemia which are acutely needed to be developed [6,7].

Pranayama is practice of breath control, which is done in synchronizing the breath with movements between Yogasanas [8]. Studies have been conducted on this practice and found to be very effective in controlling various dynamic processes including coordination ability, hypertension, and stress [9-11].

Hypothesis of the present study is, whether yoga practice Pranayama has an effect on Total Cholesterol (TC), Triacylglycerols (TAG), High Density Lipoprotein (HDL), and

Low Density Lipoprotein (LDL) variables in T2DM subjects. There are no studies on novel aspect related to the effect of Pranayama and its synergistic action with dyslipidemia in T2DM subjects.

### Materials & Methods:

Forty three T2DM subjects (22 males & 21 females), on treatment were included in T2DM group. The diagnosis of T2DM was made according to the norms laid by American Diabetes Association 2013. Exclusion criteria were: Type 1 diabetes individuals, and T2DM individuals who are less than five years of known duration of T2DM, and with complications. Inclusion criteria were diabetic, not taking multivitamin supplementations, and having no other complications. Pranayama exercise has been carried out for 60 days. Initially we have experienced minor difficulties in making the subjects to assemble in time and also to attain correct posture while doing the Yogasanas. Exercises were done for a period of 45 minutes. The description of the four Yogasanas is detailed in the study [8]. Fasting venous blood (5ml) was drawn into red top vials, after informed written consent from all the study group subjects. Serum was separated by centrifuging the blood at 3000 rpm for 20 minutes and stored in aliquots at -20° C until assayed. Serum TC was estimated by using the method of Cholesterol Oxidase and Peroxidase. Serum TAG was estimated by using the method Glycerol Phosphate Oxidase and Peroxidase. Serum HDL was estimated by using the method polyethylene glycol and phenol and 4-aminoantipyrine. All variables kits were purchased from Avantor Performance Materials India Limited, Dehradun, Uttarakhand, India. The estimations were conducted according to the instructions provided in the kit manual. LDL was calculated by using Friedwald and Fredrickson's formula.

### Statistical Analysis:

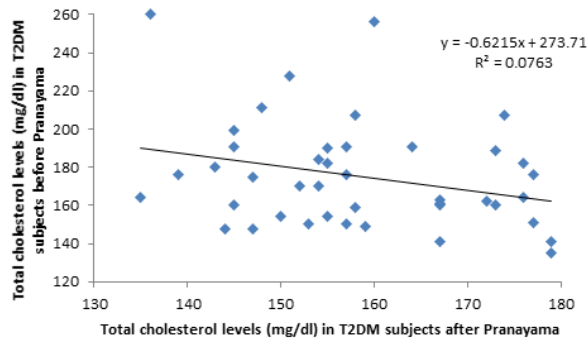
Paired 't' test was performed to compare the means of variables between two groups. Scattered diagrams were used to know the association between the two variables. Percentages were calculated. P <0.05 was considered significant.

### RESULTS:

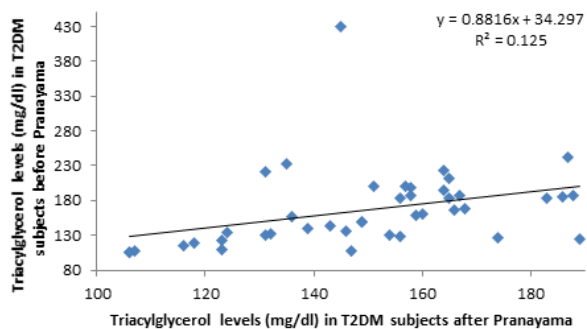
Significant difference was observed in TC levels (t=5.043, d=41) after Pranayama when compared with before Pranayama TC levels. Similar significant difference was observed in TAG levels (t=2.419, d=41) of T2DM subjects after Pranayama when compared with before Pranayama TAG

levels. On the contrary, no significant differences were observed in HDL, LDL, and VLDL levels in T2DM patients compared within the group i.e. before Pranayama and after Pranayama.

The study consists of 22 males (51%) and 21 females (49%). Figure 1 show the correlation of TC and TAG levels before and after Pranayama in T2DM subjects respectively. We observed a negative association (figure 1) when TC levels of T2DM subjects after Pranayama when compared with before Pranayama. On the contrary, we observed a positive association (figure 2) when TAG levels of T2DM subjects after Pranayama when compared with before Pranayama.



**Figure 1: Scatter diagrams showing the association of Total Cholesterol levels**



**Figure 2: Scatter diagrams showing the association of Triacylglycerol levels**

## DISCUSSION:

Data available from various cancer registries across worldwide reported, among men the second most common cause of death is cardio-vascular disease in Diabetic individuals [1]. Hypothesis of the present study is, whether yoga practice Pranayama has an effect on TC, TAGs, LDL, and HDL variables in T2DM subjects. There are no studies on novel aspect related to the effect of Pranayama and its synergistic action with dyslipidemia in T2DM subjects.

It is known that higher concentrations of plasma TC lead to increased risk of coronary heart disease whereas decrease in its value exerts a protective effect. Studies have reported the importance of physical activity like exercise in reducing dyslipidemia. A review on the effect of exercise on the lipid profile has reported an average improvement in TC and TAG levels [12]. A study conducted on short term effects of exercise on plasma lipids and lipoproteins observed decreased TAG levels after a short bout of exercise [13]. Physiologically, hyperglycemia affects lipids by increasing the genes of key enzymes responsible for lipid metabolism. Literature has shown that overexpressing SREBP-1c in adipose tissue, and hepatic SREBP-1c lipogenic transcription factors expression play a major role in developing dyslipidemia [14,15]. In one study on exercise training increases lipid metabolism gene

expression in human skeletal muscle reported that exercise increases the gene regulation and improves the anti-atherogenic factors [14]. The studies conducted have reported a decrease in TAG and increase in HDL-cholesterol, after physical activity [16]. It seems quite probable from the studies that increased physical activity leads to decreased TC and TAG concentrations which ultimately lead to reduce cardiovascular risk. The present study showed a significant difference in the levels of TC and TAG levels in T2DM subjects after Pranayama. In another study, decrease in TAG was observed at the end Pranayama practice study [11]. The findings of the present study infers that the controlling the inspiration at regular intervals led to the decrease of TC and TAG in T2DM subjects at the end of Pranayama study. Eventual deprivation of oxygen state would lead to the enhancement of degradation of TC and oxidation of TAG as well.

## CONCLUSION:

The present study had demonstrated the efficacy of Pranayama on blood lipid profiles in T2DM subjects. Physical activity along with practices like Pranayama could be helpful in individuals affected with T2DM.

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