



## Short Communication

# Short Term Effect of Sudarshan Kriya Yoga on Lipid and Hormone Profile of Type 2 Diabetic Patients

Vedamurthachar A<sup>1</sup>., Anita R. Bijoor<sup>2</sup>, Agte Vaishali<sup>3</sup>, Swathi Reddy<sup>1</sup> and Lakshmi B.<sup>1</sup>

<sup>1</sup>Ved Vignan Maha Vidya Peeth, 21<sup>st</sup> Km, Kanakapura Road, Udayapura, Bangalore, 560 082, Karnataka INDIA

<sup>2</sup>Dept of Biochemistry St.John medical college, Bangalore 560034 INDIA

<sup>3</sup>Agharkar Research Institute, G.G.Agarkar Road, Pune 411004 INDIA

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## Abstract

*Objective: The study of short term effect of an advanced Sudarshan Kriya Yoga practice as a complementary therapy for 6 days. Design: Open label intervention study. Settings/Location: Art of living international ashram. Subjects: 50 type 2 diabetic patients (22-69 yr). Interventions/therapy: Advanced SKY workshop of 6 days (Sudarshan Kriya and its accompanying practices (SK&P), taught by the Art of Living Foundation world-wide, are stress management/health promotion techniques whose health benefits are being validated by modern medical science) Outcome Measures: Plasma cholesterol, HDL, triglycerides, LDL and VLDL, FT4 and prolactin, cortisol, TSH. Results: In the participants, there was a significant decrease in plasma cholesterol ( $p < 0.03$ ), increase in HDL ( $p < 0.0001$ ), but levels of triglycerides, LDL and VLDL remained unaffected ( $p > 0.05$ ). Further, levels of FT4 and prolactin significantly increased while cortisol levels were significantly decreased ( $p < 0.05$ ). Other parameters; viz.; plasma levels of TSH remained unchanged ( $p > 0.19$ ). Conclusion: The action of SKY on lipid profile and hormonal status was of counteractive nature and felt to be distinctly different than the effect of drugs.*

**Keywords:** Sudarshan Kriya Yoga, lipid profile, hormone status, type 2 diabetes

## Introduction

Sudarshan Kriya Yoga (SKY) is a special yogic package designed by Sri Sri Ravi Shankar, the founder of Art of Living Foundation. SKY is based on rhythmic breathing exercise called Sudarshan Kriya (SK), and pranayama involving Ujjayi breathing (breath touching the throat) besides emphasizing importance of prayers, asanas, pranayama, meditation, vegetarian satvic (pure) diet and interactive discussions for attitude training based on 'Art of living' knowledge points. SKY has been shown to be a simple and economical therapeutic modality to have antidepressant effect on the mind-body complex in melancholic patients<sup>1,2</sup>. It has shown promise in reducing blood glucose levels at the end of 2 month practice by diabetics in our earlier study<sup>3</sup>. Recently, we have also demonstrated betterment of antioxidant status and anxiety levels by practice of SKY in apparently healthy adults<sup>4</sup>.

Sudarshan Kriya and its accompanying practices (SK&P), taught by the Art of Living Foundation world-wide, are management/health promotion techniques whose health benefits are being validated by modern medical science. The present investigation is focused at efficacy of 6 days of advanced SKY practice on lipid profile and hormonal status in type 2 diabetics.

## Material and Methods

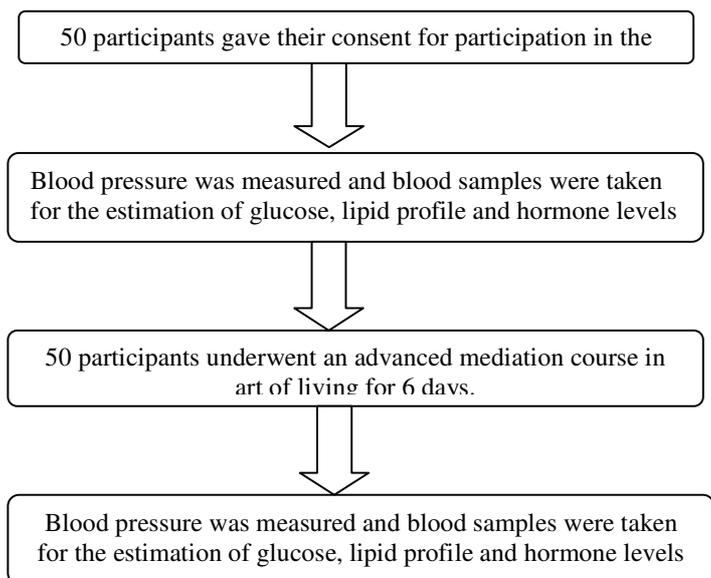
Subjects: 50 type 2 diabetic patients (22-69 yr) attended an advanced SKY training of 6 days organized at Bangalore city. An informed written consent was obtained from the participants. All the participants underwent the part 2 course of Art of Living Foundation of 6 days duration, consisting of Sudarshan kriya, guided meditations, silence, yoga (postures and breathing exercises), satsang (group singing of devotional songs) by a trained teacher. All the patients were on prescribed medications. Observations about clinical examination, biochemical tests for health status and hormone levels were recorded before undergoing the course. Same set of observations was repeated after 6 days' practice of SKY on 50 participants which gave the second observation.

The Art of Living Course, Part-II: This is a 6 day course for participants who have completed part I course and which includes Meditations, Yoga and other processes. Often a residential course, the participants are in silence for 2/3 duration of the course.

**Clinical examination:** Blood pressure was measured by doctor using a stethoscope and a sphygmomanometer by a medical doctor.

**Blood biochemistry:** Fasting blood samples were drawn and analyzed for levels of glucose, lipid profile (total cholesterol, HDL, LDL, VLDL, triglycerides) and hormone levels (TSH, FT4, Prolactin and cortisol) using standard kits (India).

**Statistical methods:** All the estimations were done in duplicates. Differences between means were tested by paired t test. Results were considered significant.



## Results and Discussion

**Biochemical changes in the participants:** Table-1 shows the average levels of total cholesterol, HDL, LDL and VLDL before and after 6 days of SKY training. The mean value of TG before undergoing SKY workshop was  $125.90 \pm 70.8$ , and after undergoing SKY workshop was  $134.03 \pm 53.1$ . Although there was a slight increase in TG levels, these were not statistically significant ( $p=0.33$ ). The mean value of total cholesterol before undergoing SKY workshop was  $188 \pm 45.2$ , and after undergoing SKY workshop was  $172.08 \pm 39.7$ . There was a significant decrease in total cholesterol by 26 mg/dL ( $p=0.03$ ). Moreover, the mean value of HDL level before undergoing SKY workshop was  $58.87 \pm 17.3$  and after undergoing SKY workshop was  $79.54 \pm 26.9$ . The HDL levels

were significantly increased by about 10 mg/dL ( $p<0.0001$ ). The mean value of LDL level before undergoing SKY workshop was  $48.25 \pm 54.5$  and after undergoing the SKY workshop was  $41.96 \pm 28.9$ . The mean value of VLDL level before undergoing SKY workshop was  $25.18 \pm 14.2$ , and after undergoing the SKY workshop was  $26.80 \pm 10.6$ . Changes in LDL and VLDL levels were not statistically significant ( $p>0.05$ ).

**Hormonal changes in the participants:** Table-2 shows the average levels of hormones before and after 6 days of SKY training. The mean value of TSH level before undergoing SKY workshop was  $3.43 \pm 2.0$  and after undergoing the SKY workshop was  $3.21 \pm 1.9$ . The TSH levels were decreased marginally but the change was not statistically significant ( $p>0.19$ ). The mean value of FT4 level before undergoing SKY workshop was  $0.95 \pm 0.15$ , and after undergoing the SKY workshop was  $1.18 \pm 0.90$ . The FT4 levels were significantly increased. The mean value of cortisol levels before undergoing SKY workshop was  $14.19 \pm 4.6$  and after undergoing the SKY workshop was  $12.34 \pm 3.0$ . The FT4 and cortisol levels were significantly decreased and in the mean value of prolactin before undergoing SKY workshop was  $7.71 \pm 4.4$  and after undergoing the SKY workshop was  $8.85 \pm 4.1$ . The prolactin levels were significantly increased ( $p<0.05$ ).

**Discussion:** Yoga is well known as the ancient lifestyle approach for healthy mind and healthy body. A review of research published between 1970 and 2004 on the effects of yoga on insulin resistance and cardiovascular disease has been done<sup>5</sup> based on 70 studies. These studies provide evidence that yoga can improve many physiological indicators of insulin resistance and cardiovascular disease, including glucose tolerance and insulin sensitivity, lipid profiles, anthropometric characteristics, blood pressure, oxidative stress, coagulation profiles, sympathetic activation, and cardiovascular function. Sudarshan kriya yoga includes meditation, pranayam, yogasanas, art of living knowledge points including living in the present moment and above all Sudarshan Kriya; a cycle of breaths. By doing SKY body gets enough oxygen which can alleviate cellular metabolism. SKY also propogates adhering to 'Satvic' diet, avoiding sweets, fries and spicy foods.

**Table-1**  
Mean values before and after SKY with results of paired t test for lipid profile

Biochemical parameters	Mean value (Before)	Mean value (After)	t value	P value
Triglycerides	$125.90 \pm 70.8$	$134.03 \pm 53.1$	0.96	0.33
Cholesterol	$188.13 \pm 45.2$	$172.08 \pm 39.7$	1.99	0.03
HDL Cholesterol	$58.87 \pm 17.3$	$79.54 \pm 26.9$	-4.29	0.0001
LDL Cholesterol	$48.25 \pm 54.5$	$41.96 \pm 28.9$	0.86	0.20
VLDL Cholesterol	$25.18 \pm 14.2$	$26.80 \pm 10.6$	-0.96	0.17

**Table-2**  
**Mean values before and after SKY with results of paired t test for hormones**

Hormone	Mean value (Before)	Mean value (After)	t value	P value
TSH	3.43± 2.0	3.21± 1.9	0.88	0.19
FT4	0.95± 0.15	1.18 ±0.90	-1.73	0.04
Cortisol	14.19±4.6	12.34±3.0	3.0	0.002
Prolactin	7.71±4.4	8.85±4.1	-1.98	0.03

The prevalence of diabetes is highest among Indians with one in five diabetics to be Indian since the year 2005. The prevalence is increasing, particularly among youth and young adults, in parallel with the continuing rise in obesity. Type 2 diabetes is considered to be a psychosomatic disease associated with oxidative stress. Sudarshan Kriya is a rhythmic breathing and relaxation technique helpful in improving cellular oxygen uptake and in turn glucose metabolism in diabetes

Sudarshan Kriya yoga also includes adhering to 'satvic' diet which is essentially fresh food: fruits and vegetables. In diabetic patients, immediate decrease of blood sugar has been observed after the session of Sudarshan Kriya in a recent study, SKY practice by 87 type 2 diabetics which also resulted in reduction in oxidative stress, total cholesterol and fasting glucose level<sup>3</sup>.

Short-term (9 day) impact of a brief lifestyle intervention based on yoga on some of the biochemical indicators of risk for cardiovascular disease and diabetes mellitus on 98 subjects has been reported<sup>6</sup>. Changes in blood glucose and glucose tolerance by oral glucose tolerance test (OGTT) after 40 days of yoga therapy in 149 NIDDM have also been reported<sup>7</sup>. These studies support our finding about SKY with a difference that SKY demonstrated immediate changes in comparison to classical yogic techniques.

In a study conducted at Hyderabad, India, on 73 healthy volunteers, men showed reduced levels of serum triglycerides and VLDL-cholesterol at the end of the first 30 days (pranayama practice only), and increased levels of HDL-cholesterol (the "good" cholesterol) and free fatty acids at the end of both the first 30 days (pranayama practice only) and at the end of the 3-month session. There was no change in LDL-cholesterol. Women showed reduced levels of serum free fatty acids at the end of both the first 30 days (pranayama only) and the 3-month session, and also showed reduced levels of total cholesterol, triglycerides, LDL-cholesterol and VLDL- cholesterol by the end of the 3-month session. There were no changes in HDL-cholesterol<sup>8</sup>. In the present study, a reduction in total cholesterol and rise in HDL with no change in LDL has been observed at the end of just 6 days of advanced SKY training. This might be due to coupling of SKY with relaxation techniques, dietary modifications (Satvic diet) and silence.

Researchers at the Universite de la Mediterranee in France studied the effects of ujjayi breath training on everyday

breathing patterns. After the training, participants showed a significant increase in exhalation duration and a modest increase in tidal volume<sup>9</sup>. SKY also emphasizes the use of ujjayi breathing during pranayama which helps in better exchange of oxygen and carbon dioxide during every breath.

Sudarshana Kriya Yoga (SKY) has demonstrable antidepressant effects. Results extend the antidepressant effects of SKY in alcohol dependence subjects. Reduction in Stress-hormone levels (cortisol and ACTH) along with BDI reductions possibly support a biological mechanism of SKY in producing beneficial effects<sup>10</sup>. Kamai et al<sup>11</sup> examined changes in brain waves and blood levels of serum cortisol during yoga exercise in 7 yoga instructors and found that alpha waves increased and serum cortisol decreased.

## Conclusions

This preliminary study on short term effect of advanced SKY has indicated beneficial action on lipid profile and some stress hormones like cortisol and prolactin and further systematic studies using large sample and multiple locations are needed to confirm these results.

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**Interest of conflict:** No commercial associations that might create a conflict of interest in connection with submitted manuscripts are applicable. VMC was the senior investigator as well as teacher of the SKY workshop. He planned the entire study, supervised the observations recorded, analyzed the data and drafted the manuscript. Both LB and SR were junior investigators and participated in SKY workshop as well as taking on site observations. VG was a senior faculty of SKY workshop and senior scientist from AMC pune, also contributed in planning the study, analyzing data and writing the manuscript. There are no other competing financial interests of all authors which have not been appropriately disclosed.

## References

1. Janakiramaiah N., Gangadhar B.N., Naga Venkatesha Murthy P.J. Antidepressant efficacy of Sudarshan Kriya Yoga (SKY) in melancholia: a randomized comparison with electroconvulsive therapy (ECT) and imipramine, *J Affect Disord*, (57), 255-259 (2000)
2. Naga Venkatesha Murthy P.J., Janakiramaiah N, Gangadhar BN, Subbakrishna DK. P300 amplitude and antidepressant response to Sudarshan Kriya Yoga (SKY), *J Affect Disord*, 50(1), 45-8, (1998)
3. V.V. Agte, K.T. Tarwadi, Potential of Sudarshan kriya yoga practice in treatment of type 2 diabetes. *Alternative and Complementary Therapies*, (1094), 220-222, (2004)
4. Agte V.V. and S.A. Chiplonkar "Practice of sudarshan kriya yoga for betterment of antioxidant status and anxiety levels" *Alternative and Complementary Therapies* April, 14(2), 96-100, (2008)
5. Innes K.E., Bourguignon C. and Taylor A.G., Risk indices associated with the insulin resistance syndrome, cardiovascular disease, and possible protection with yoga: a systematic review. *Journal of American Board of Family Practice*, 18(6), 491-519, (2005)
6. Bijlani R.L., Vempati R.P., Yadav R.K., et al. A brief but comprehensive lifestyle education program based on yoga reduces risk factors for cardiovascular disease and diabetes mellitus, *J Altern Complement Med*, 11(2), 267-74 (2005)
7. Jain S.C., Uppal A., Bhatnagar S.O., et al. Study of response pattern of non-insulin dependent diabetics to yoga therapy, *Diabetes Res Clin Pract* 19(1), 69-74, (1993)
8. Prasad K.V.V., Sunita M., Raju P.S., et al. Impact of Pranayama and Yoga on Lipid Profile in Normal Healthy Volunteers, *Journal of Exercise Physiology Online*, (9), 1-6.
9. Khalsa S.B., Ujjayi Breath Training Changes Everyday Breathing Patterns. *Applied Psychophysiology and Biofeedback* (29), 269-78, (2004)
10. Vedamurthachar A., Janakiramaiah N., Hegde J.M., et al. Antidepressant efficacy and hormonal effects of Sudarshana Kriya Yoga (SKY) in alcohol dependent individuals, *J Affect Disord*, 94(1-3), 249-53 (2006)
11. Kamei T., Toriumi Y., Kimura H., et al. Decrease in serum cortisol during yoga exercise is correlated with alpha wave activation, *Percept Mot Skills*, 1027-32, (2000)