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## Biochemical studies on the combined effects of sudarshan kriya and mudra pranayam on human body: A preliminary investigation

**Meenakshi Suresh and K Suresh**

### Abstract

Study of biochemical parameters were undertaken on selected volunteers to understand the combined effects of Sudarshankriya and Mudra pranayam on human body. The results of the studies indicated marked improvement in volunteers with mild, moderate depression. Substantial improvement in their biochemical profile was observed that resulted in slow and steady reversal of their abnormal biochemical parameters back to near normal values. Daily practice of the techniques resulted in bringing their BMI and waist hip ratio reverting to normal limits. Blood pressure monitoring of the study group with mild to moderate hypertension showed reduction in systolic and diastolic pressures and there was marked improvement in the immunity of the selected volunteers.

**Keywords:** Pranayam, Sudarshankriya, Mudras and Bandhas, Stress, Biochemical profile.

### 1. Introduction

Biochemical investigations are the basis of understanding, the overall clinical and metabolic state of an individual. Any deviations in the levels of biochemical parameters from their normal values indicate the onset and progress of disease or disorder.

The metabolic activities of our body require oxygen to release energy via cellular respiration, in the form of the metabolism of energy-rich molecules such as glucose, fatty acids and amino acids. Breathing is the process that supplies oxygen to the cells of our body and removes waste such as carbon dioxide out of our system. It is one type of physiological respiration that is considered essential to sustain life <sup>[1]</sup>.

Ventilation or Breathing is a semi voluntary activity of the muscles of the chest that includes both inhalation and exhalation. It has been observed from various studies that the rhythm of breath is altered during stress and other metabolic disorders.

Breathing is one of the few functions of our body that can be controlled both consciously and unconsciously within certain limits. The practice of different forms of pranayama and meditation helps us to have conscious control of breathing <sup>[2]</sup>. Several studies have indicated that breath regulation has profound effects on overall health and well being of an individual. Pranayam is the science that deals with regulation of Prana: settled life energy.

Sudarshankriya is a simple, rhythmic breathing technique practiced by millions of people across the globe. This technique is taught worldwide by the International Art of living foundation founded by Sri Sri Ravishankar. Mudras are neuromuscular gestures that are practised to enhance and intensify the effects of pranayam. Sudarshankriya and Mudra pranayam, are natural breathing techniques, which is free of unwanted side effects. It can help to reduce the hospital and doctor expenses, as indicated by the reports of research work on many case studies results thus making the technique cost effective.

In the current studies, the combined effects of Sudarshan Kriya and Mudra pranayam was undertaken to study the biochemical profile of the selected volunteers with noncontagious diseases and disorders.

### 2. Materials and Methods

#### 2.1 Participants

In this study, the volunteers included were above 35 years of age, who had noncontagious medical conditions prior to the Art of Living's programs. They were instructed to learn the technique of Sudarshan Kriya and Mudra Pranayam in Happiness and Advanced Meditation programs, respectively, conducted by Art of Living Foundation.

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The volunteers of the study group were instructed to practice short Sudarshan Kriya and Mudra Pranayam, daily, for 180 days. Regular, weekly follow up sessions of long Sudarshan Kriya were conducted for the volunteers. After 180 days physical and biochemical studies were undertaken on the volunteers of study group.

## 2.2 Warm Up activity

All the selected volunteers undertook quick warm up that included slow, medium, fast walking and jogging on the spot for 5 minutes. This was followed by spot jumping and body twisting to increase their breathing rate to 30% above normal.

The increased breathing rate was reduced by slowing down the pace of their jogging and the warm up sessions were concluded by slow walking on the spot. The participants were instructed to relax and were made to observe the rhythm of their breath with closed eyes till the breath became normal.

## 2.3 Body rotations and Stretches

The warm up sessions were followed by rotations of various body parts that included the neck, both the shoulders, hip, moving both the knees in forward and backward directions, and rotation of both the ankles. This was followed by stretches of various parts of the body.

## 2.4 Yogasanas

Sun salutations (6 sets), asanas of Padmasadhana that included, upper body rotation, Shalabhasan (Locust pose), Bhujangasan (Cobra Pose), ViparitShalabhasan (Superman pose), Dhanurasan (Bow posture), Naukasan (Boat posture), Pawanmuktasan (wind relieving pose), Sarvangasan (shoulder stand posture), Natarajasan, Ardhamacchendrasan (Spinal twist), Parvatasan (mountain posture), yogamudra followed by Nadishodhan Pranayam (alternate nostril breathing) were practiced every day.

## 2.5 Yoga Nidra

The 30 minute Yoga sessions concluded with the practice of Yoga Nidra in Shavasan. Instructions were given to the participants to take their attention to various parts of their body effortlessly, with their eyes closed.

## 2.6 Different types of Pranayam, Bandhas and Sudarshan Kriya

The sequences of breathing techniques that precede the Sudarshan Kriya were taught to the selected volunteers<sup>[3, 4]</sup>.

## 2.7 Three stages Pranayam

To start the three stage Pranayam, the volunteers sat in Vajrasana posture and practiced the Pranayam in three stages, using a deep breathing technique called the Ujjayi breath or "Victorious Breath". This breathing was practiced with full awareness, experiencing the conscious sensation of the breath touching the throat. The Ujjayi breathing was done as per fixed number of prolonged and exact counts in each stage.

In the first stage the thumbs are placed on the pelvic bone and the remaining four fingers are aligned to naval point. A minimum of eight sets of Ujjayi breathing rounds were practiced. It involved a routine breathing in, holding the breath and subsequently breathing out for a definite period of time as per fixed counts.

In the second stage the thumbs were placed in the armpits and rest four fingers were aligned on the chest and Ujjayi breathing were similar to the breathing pattern observed in first stage.

In the third stage, palms are placed on shoulder blade and elbows pointing towards the Sky. A minimum of six sets of Ujjayi breathing rounds were practiced for a definite period of time as per fixed counts.

## 2.8 Bhastrika Pranayam

After the three stages of Pranayam, the volunteers practiced Bhastrikapranayam or "Bellows Breath" while maintaining the Vajrasana posture. It was practiced using normal breath in sets of three rounds. In each round consisting of 20 counts of breathing, with concomitant movement of hands up and down using folded fists, the air was rapidly inhaled and forcefully exhaled at a rate of 30 breaths per minute.

## 2.9 Bandhas

After every round of Bhastrika Pranayam the volunteers applied bandhas (mool udayan and jalandharbandh) for about 20-30 seconds.

## 2.10 Mudra Pranayam

After three rounds of Bhastrika Pranayam, the volunteers released the Vajrasana posture and sat in Sukhasana posture. In this posture, they practiced Mudra Pranayam using Ujjayi breath with various mudras that included Chin, Chinmayi, Adi and Merudand mudra. In each of the Mudra, 8-12 long and deep Ujjayi breaths were inhaled and exhaled.

## 2.11 Om chanting

After deep normal breath, "Om" was chanted three times with expiration.

## 2.12 Sudarshan Kriya

Short SudarshanKriya was practiced using normal breath. The short Kriya involves three rounds with each round having slow, medium and long inhalation and exhalation with varying rhythms. The practice involved rhythmic breathing, where, each cycle consisted of 20 slow and long breaths, 40 medium and shorter breaths and 40 fast and short breathing. After three cycles, 10 long and deep breaths were taken. The entire breathing cycle of short SudarshanKriya lasted for 7 to 9 minutes followed by observing silence for about 15-20 minutes.

The weekly follow-up included long SudarshanKriya with multiple rounds of rhythmic breathing for 25 minutes followed by lying down in supine position for about 20 minutes.

## 2.13 Blood pressure measurement

Blood pressure was monitored using sphygmomanometer.

## 2.14 Height and Weight check

Weight check was done using calibrated weighing balance and BMI was calculated with the formulaas  $BMI = \text{Weight in kilograms} / (\text{Height in meters})^2$ . Volunteers with Values <18.5 were considered as indication of underweight, Values between 18.5 -24.9 as Normal weight and values 25-29.9 indicated overweight and above 30 or greater was considered as Obesity category.

**2.15 Waist- Hip ratio**

The Waist-Hip parameters was measured using inch tape and ratio was calculated as  $W (cm) \div H(cm)$ .and the correlation between the WHR and estimated health risk was recorded as per Table 1:

**Table 1**

Females	Estimated health risk
0.80 or below	Low
0.81 to 0.85	Moderate
0.85+	High
Males	Estimated health risk
0.95 or below	Low
0.96 to 1.0	Moderate
1.0+	High

**2.16 Blood sugar**

Fasting, postprandial and random blood sugar levels were analyzed by Hexokinase method.

**2.17 Complete blood count**

Complete whole blood counts including, RBC, Hemoglobin, Haematocrit, MCV, MCH, MCHC, RDW. Total and differential leukocyte counts including neutrophils, lymphocytes, monocytes and eosinophils. Platelet counts were conducted. Methods included were either impedance or calculation method.

**2.18 Lipid profiles**

Serum lipid profiles were monitored for LDL cholesterol (by calculation method), total cholesterol (by peroxidase method) serum triglycerides (GPO-TRINDER method) cholesterol-HDL (by direct homogenous method), Cholesterol-VLDL (by calculation) and VLDL and HDL cholesterol ratio (by calculation).

**2.19 Cortisol levels**

Random serum cortisol levels were monitored by CMIA method.

**2.20 Electrocardiogram studies**

These studies were undertaken on volunteers were conducted by Electrocardiography method.

**2.21 The lung function tests**

Forced expiratory volume was checked by spirometry to assess the functioning of lungs.

**3. Results and Discussions**

Disorders to due erratic lifestyle, increased pollution in the environment, Psychosomatic disturbances, Poor stress levels and their related disorders have been found to be on the rise among humans [5]. Biochemical studies of combined effects of Sudarshankriya and Mudra pranayam showed marked improvement in the medical condition of the selected volunteers regardless of the severity of their disease or disorders. The results of the studies indicated the applicability of Sudarshankriya and Mudra pranayam to bring about neurophysiological and therapeutic benefits on human body.

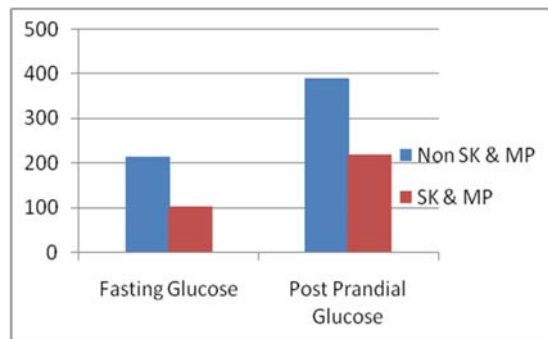
Substantial improvement in their biochemical profile was observed in three weeks. Furthermore, by the end of 180 days, 50% of the volunteers reported on slow and steady reversal of their abnormal biochemical parameters back to

near normal values. Studies included blood sugar [6] monitoring Figure1 and Lipid profile.

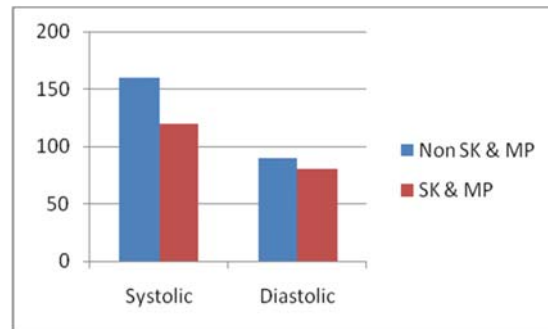
Monitoring of blood pressure in the study group with mild to moderate hypertension showed reduction in systolic and diastolic pressures in 25% of the volunteers. Figure 2. This was supported by their normal ECG reports. This could be attributed to improved lung function.

Within one week of practice 85% of the volunteers with mild, moderate depression reported 100 percent relief from stress and fatigue. The results indicate increase oxygen supply to brain. The monitoring of marker hormones plasma cortisol and plasma prolactin levels that are indicators of stress levels were undertaken. Significant decrease in plasma cortisol levels and a marked increase in plasma prolactin level were seen in the blood of volunteers within 15 days of practice of Sudarshan Kriya and Mudra Pranayam and the normal levels were seen to be maintained after 180 days of regular practice as well. Stable plasma cortisol and prolactin levels indicate that the regulated breathing techniques act as natural antidepressants and with regular practice prevents the reversal of stress, depression and anxiety disorders[7][8][9]. Body Mass Index (BMI) is a simple index of weight-for-height that is commonly used to classify underweight, overweight and obesity in adults. Among the selected obese and overweight volunteers 30% of them starting losing weight after 40 days of daily practice of all the techniques. The WHR or the waist –Hip ratio has been used as an indicator or measure of health, and the risk of developing serious health conditions. The BMI values and Waist-Hip ratio of the selected volunteers was found to get back within normal limits with regular practice of these techniques.

The results of clinical investigations showed positive results on overall improvement in immunity of the chosen volunteers. Similar results were observed in earlier research studies [10].



**Fig 1:** Effect of Sudarshan kriya and Mudra Pranayam on Diabetes patients



**Fig 2:** Effect of Sudarshan kriya and Mudra Pranayam on Hypertension patients

#### 4. Conclusion

Study of biochemical parameters were undertaken on selected volunteers to understand the combined effects of Sudarshan Kriya and Mudra pranayam on human body. 85% of the volunteers with mild, moderate depression reported 100 percent relief from stress and fatigue. Substantial improvement in their biochemical profile was observed that resulted in slow and steady reversal of their abnormal biochemical parameters back to near normal values. 30% of the volunteers starting losing weight after 40 days of daily practice with their BMI and waist hip ratio reverting to normal limits. Blood pressure monitoring of the study group with mild to moderate hypertension showed reduction in systolic and diastolic pressures in 25% of the volunteers and there was marked improvement in the immunity of the selected volunteers.

#### 5. Acknowledgments

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