



RESEARCH ARTICLE

EFFECT OF SAHAJA YOGA ON MDA (MALONDIALDEHYDE) AND BLOOD THIOL LEVELS IN HYPER-REACTORS TO COLD PRESSOR TEST IN YOUNG HEALTHY VOLUNTEERS

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ABSTRACT

Sahaja Yoga is a unique method of meditation based on an experience called Self Realization (Kundalini awakening) and aims at achieving holistic health care for people, Gupta *et al* (2015). A study was designed to assess the effect of Sahaja Yoga meditation on Blood Pressure (B.P), plasma MDA levels and blood thiol level in 40 hyper-reactors to cold pressor test (in the age group of 20-25 years) and was compared with B.P., plasma MDA levels and blood thiol levels in same hyper-reactors before starting the yoga. Blood samples were taken before starting the yoga and 90 days after Yoga practicing. The value of B.P., Plasma MDA level was found to be significantly reduced ($p < 0.001$) and blood thiol level was raised significantly ($p < 0.001$) after 90 days of Sahaja yoga. Similarly, Reduction in oxidative stress suggests that Sahaja Yoga can be used as a complimentary therapy in the management of cardiovascular diseases, diabetes and stress related disorders.

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INTRODUCTION

Now a day, stress is dangerous & significant problems of World & affects Physical, mental, behavioral, & emotional health. Yoga has been reported to control stress, to be beneficial in treating stress related disorders, improving autonomic functions, lower blood pressure, increase strength & flexibility of muscles, improve the sense of well being, slow ageing process, control breathing, reducing signs of oxidative stress & improving spiritual growth (Chanda Rajak *et al.*, 2012). Stress is described as a state of anxiety, strain, nervousness, tension, constant worry or pressure. It is an accepted fact that psychosocial factors operate through mental processes, consciously or unconsciously, to produce hypertension and other cardiovascular disorders (Arnljot Flaa *et al.*, 2008). Cardiovascular disease has become a major cause of mortality in developing nations due to hypertension in the age group of 30- 69 years (Gaziano *et al.*, 2007). Sahaja Yoga is a special kind of meditation, with a wide range of subtle effects on the body, and has been practiced worldwide since 1970. It is assuming importance in improving mental health and quality of life in the treatment of a number of psychiatric and psychosomatic disorders & its meditative experience

characterized by the feeling of a complete mental silence along with a state of complete mental alertness leading to a sensation of positive mood, benevolence and relaxation (Manocha, 2000). Study on the effects of yoga on cognitive functions has shown improvement in memory, vigilance & anxiety (Mohan *et al.*, 1986; Kabat *et al.*, 1992). Sahaja Yoga has shown beneficial effect in the management of hypertension, bronchial asthma (Chugh, 1987, Manocha *et al.*, 2002) and epilepsy (Panjwani *et al.*, 1995). Scientific studies on Sahaj Yoga have also demonstrated its role in reduction in anxiety levels (Batra; 1999), improvement in sensory-motor functioning, reaction time (Ravi, 1998) and better autonomic control (Rai *et al.*, 1998) in healthy practitioners. Independent research has shown that significantly reduced levels of cortisol reduce the level of stress, relieve anxiety, depression, increase anti – oxidant production, enhance brain function, enhance the sense of well – being and peace of mind (Quelle, 2007). However, biochemical parameters have not been studied yet and there is paucity of data of the effects of Sahaj Yoga on oxidative stress which can be asses by B. P., serum MDA levels and blood thiol levels. Therefore the alternative approaches i.e. Sahaja Yoga with potential cognitive enhancement effects, if any, have been explored in this study. Meditation, yoga, progressive muscular relaxation or cognitive therapy may reduce the BP to a variable degree and combination of these treatments may be even more successful. Stress reduction via Transcendental Meditation has been shown to lower BP levels and reduce CVD risk in adults

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and adolescents (Silverberg DS; 1990). "Yoga" Practice has been shown to be effective in improving mood and decreasing stress and depression (Sahoo *et al.*, 2000). During exercise alpha waves are increased in the brain (increase calmness) and blood level of cortisol decreases which is a stress hormone. (Kamei *et al.*, 2000) Vagal tone increases and sympathetic tone decreases after "yoga" practice (Bagchi *et al.*, 1961). Yogic practices can be used as psycho-physiologic stimuli to endogenous secretion of melatonin, which, in turn, might be responsible for improved sense of well-being (Harinath; 20004). In the study of hypertension, cold pressor test, introduced by Hines and Brown, was employed to measure the cardiovascular Reactivity (Hines EA Jr, Brown GE; 1936). The persons hyper-reactive to cold pressor test are susceptible for early onset of hypertension. (Yates *et al.*, 1936, Wood,1984, Karen *et al.*, 2004, Garg 2010). We tested whether regular practice of Yoga for 3 months can reduce the cardiovascular hyper-reactivity, for reducing the morbidity and mortality from cardiovascular disorders.

MATERIALS AND METHODS

Study group comprised 100 healthy male subjects of 20-25 years. They were subjected to cold pressor test according to Hines & Brown (Hines Jr, Brown, 1936). Out of 100 volunteers, 40 turned out to be hyper-reactive to this provocative test.

All the volunteers were clinically examined to rule out any systemic diseases. All subjects were non-alcoholic and non-smokers. They were not taking any drugs, and they had similar dietary habits as well as physical and mental activities at work and home. These hyper-reactive volunteer performed yoga twice a day at the dept of Physiology as well as at home. All the 40 volunteers were trained under the guidance of a certified "yoga" teacher for 15 days. They carried out Sahaj Yoga for 60 minutes, twice a day for three months, under supervision, in a prescribed manner. The schedule consisted of- BP was measured in supine posture by Sphygmomanometer (Perloff 1993) Two reading were taken five minutes apart and the mean of two was taken as the BP. For cold pressor test, a thick walled thermocol box measuring 38 cm × 26 cm × 18 cm, closed from all sides, was used. A hole was made in the centre of the top of the box to allow entry to one hand of the subject. Another small hole was made at the corner of the top of the box for laboratory thermometer. Before starting the experiment the box was filled a mixture of ice and water and the laboratory thermometer was placed such that its mercury bulb was immersed in the mixture of ice and water. Temperature inside the box was measured about 3⁰-4⁰C. The hand was immersed in cold water up to the wrist for one minute (cold stress). An elevation above the basal level of more than 20 mm of Hg in systolic or of more than 15 mm in diastolic was considered as hyper-reactive response Hines EA Jr, Brown, 1936).

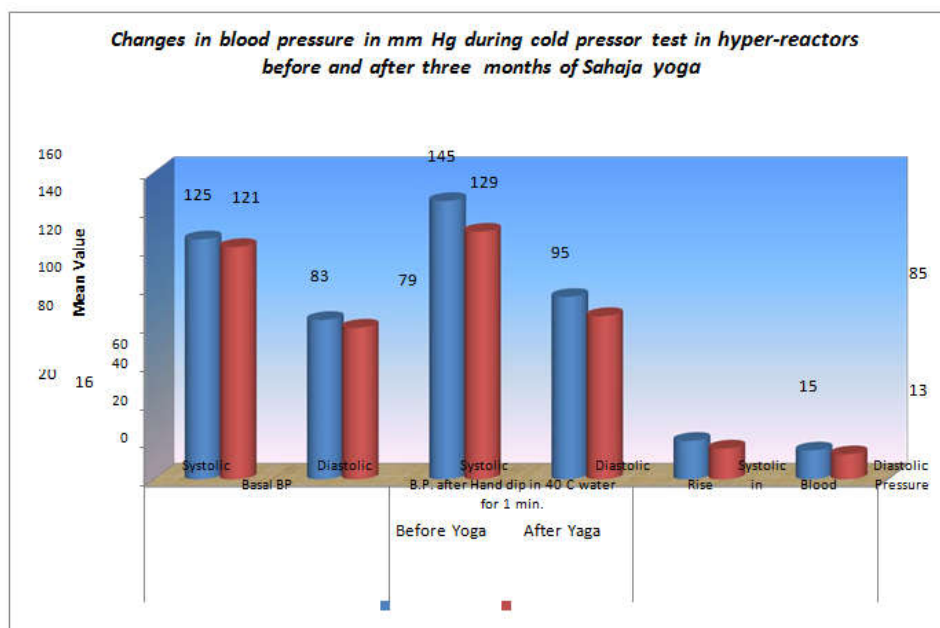


Figure No 1.

The hyper-reactivity of 40 volunteers converted to hypo-reactivity after the yoga therapy of three months (100%). Other parameters like Blood Pressure, serum MDA levels reduced and blood thiol levels increased significantly by using student's t test. The study protocol was explained to the subjects and written consent obtained. Approval by ethical committee of S.S. Medical College, Rewa, M. P., was obtained.

Biochemical Parameters Studied

Firstly, a baseline fasting venous blood sample (approx. 7 ml) was collected from all subjects before starting the sahaja yoga & after 90 days of sahaja yoga under the study. The volunteers were assessed for MDA and blood thiol levels. MDA was estimated by Buege's method. In this method, the product of lipid peroxidation i.e. MDA reacts with thiobarbituric acid (TBA) to give a red chromogen, the

absorbance of which is read at 535 nm (Kumar *et al.*, 1995). Total Thiols- was estimated by Ellman’s method, in this method, 5-5 dithiobis-2-nitrobenzoic acid reacts with total sulphhydryl groups to form a chromogen whose extinction is measured at 420 nm (Ellman, 1959).

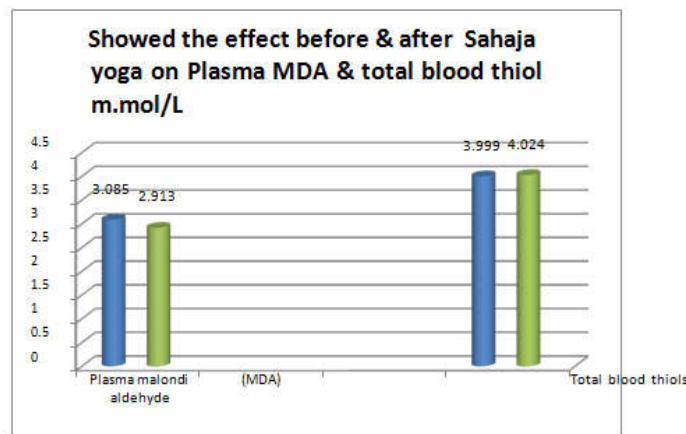
Blood Pressure: The mean systolic B.P. decreased from 125 + 3.81 mm Hg to 121 + 5.56 mm Hg & the mean diastolic B.P. months of sahaja yoga, Due to cold pressor test , before practicing Sahaja yoga, average rise in systolic B.P. was 20.45 decreased from 83 + 4.12 mm Hg to 79 ± 6.0 mm Hg after 3 + 3.18 mm Hg, and this rise was reduced to 16 + 3.64 mm Hg

Table 1. showing changes in blood pressure in mm Hg during cold pressor test in hyper-reactors before and after three months of Sahaja yoga

S. No.	Parameters		Before Sahaja yoga.		after three months of Sahaja yoga.		P Value	
	Blood Pressure (mm Hg)		Mean Value	S. D.	Mean Value	S. D.		
1	Basal B. P.		Systolic	125.0	± 3.81	121.0	± 5.56	p<0.0001
			Diastolic	83.0	± 4.12	79.0	± 6.0	p<0.0002
2	B.P. after Hand dip in 40 C water for 1 min.		Systolic	145.0	± 6.63	129.0	± 6.74	p<0.0002
			Diastolic	95.0	± 6.23	85.0	± 4.74	p<0.0004
3	Rise in Blood Pressure		Systolic	20.0	± 3.18	16.0	± 3.64	p<0.0382
			Diastolic	15.0	± 6.63	13.0	± 3.14	p<0.0385

Table 2. Showing comparison in Plasma malondialdehyde (MDA) (mmol/L) and Total blood thiols concentration (mmol/L) in hyper-reactors before and after three months of Practicing Sahaja yoga

S. No.	Biochemical Parameters	Before Sahaja yoga. (mmol/L)		After three months of Sahaja yoga. (mmol/L)		P Value
		Mean Value	S. D.	Mean Value	S. D.	
1	Plasma malondi aldehyde (MDA)	3.085	± 0.112	2.913	± 0.106	p<0.001
2	Total blood thiols	3.999	± 0.178	4.024	± 0.192	p<0.001



Statistical Analysis: The data was recorded; mean and standard deviation were calculated for each group. Results were statistically analyzed by Students t- test. Paired t” test was used for inter group comparisons. The interpretation of P values were highly significant, (P<.001) in all three parameters.

RESULTS

Our results showed that “Sahaja Yoga” causes significant reduction in the cardiovascular hyper-reactivity. A total of 100 male volunteers were included in the study. Out of which 40 were hyper-reactor to cold pressor test. These hyper- reactors practiced Sahaja yoga regularly for three months and after this period the all 40 hyper-reactors changed & they become hypo-reactors. The statistical analysis was carried out using student „t” test. It was observed that the basal blood pressure, and rise in BP due to cold stress before and after the Sahaja yoga (Table- 1),

(p<0.0382) after 90 days of practicing of Sahaja yoga. While the rise in diastolic B.P. initially was 15 + 6.63 mm Hg and this reduced to 13 + 3.14 mm Hg (p<0.0385). In present study mean plasma malondialdehyde (MDA) concentration in 40 hyper reactors in age group (20-25 years) was found to be significantly reduced (p<0.001) and total blood thiol level was raised significantly (p< 0.001) after 90 days. of practicing Sahaja Yoga. (Table-2),

DISCUSSION

On analyzing the effect of yoga in normal subjects of age group 20-25 years, in our study, the cardiovascular autonomic function tests were studied out before and after three months, of “Sahaja yoga”. The volunteers after “Sahaja yoga” practice showed autonomic equilibrium between sympathetic and parasympathetic nervous system.

In the present study we observed that there was significant difference in blood pressure, and reactivity to cold pressor tests after practicing “Sahaja yoga” which indicates decrease in sympathetic activity and increase in parasympathetic activities which is mainly due to increase in vagal tone (Gharote,1973; Gopal *et al.*, 1973).The autonomic nervous system plays a major role in bringing about adaptation of human body to environmental changes, thereby modulating the sensory, visceral, motor and neuro-endocrine functions, regulates the activity of all muscles, and certain glands. Autonomic nervous system is one of the most important mediators of this response and these changes may be responsible for the present observation in cold pressor test (Sahoo *et al.*, 2010). Everybody is invariably exposed to professional, social and environmental stress. Stress and meditation are often recommended as a way to relieve stress and improves the ability of cardiovascular system and mental status of the subjects ($p < 0.001$), by modulating and optimizing sympathetic activities (Gharote 1973; Gopal *et al.*, 1973). Restoring equilibrium, thereby avoiding intervention of inhibitory parasympathetic system (Sahoo *et al.*, 2010).

Sahaja Yoga is a form of “Kundalini Yoga” which describes a simple technique to arouse the latent potential of man by a simple meditative process. The science focuses on awakening the dormant primordial energy (the Kundalini), whereby a flow of subtle cool cosmic vibrations in the body is achieved which nourishes and rejuvenates each and every cell of the body. In present study we observed that subjects practicing Sahaja Yoga have shown a significant reduction in serum MDA concentration and a concomitant rise in total blood thiols level up to 90 days. (Suduang *et al.*, 1991) have shown that practising Dhammakaya Buddhist meditation produces certain biochemical and physiological changes and reduces the reaction time (the interval time between the presentation of a stimulus and the initiation of the muscular response to that stimulus). They reported a significant increase in serum total protein and reduction in serum cortisol levels in male subjects of age 20-25 years (Vyas *et al.* 2008). Vandana *et al.* (2011) studied the impact of integrated Amrita Meditation Technique (IAMT) on adrenaline and cortisol levels in healthy college students (age 18-21 years).

Meditation techniques such as Sahaja Yoga have been suggested to have a deep impact on the autonomic nervous system including activation of parasympathetic response (Manocha R., 2000). Meditation is also believed to gradually diminish sympathetic dominance, resulting in a better balance between the sympathetic and parasympathetic (Anand, 1991). It also brings about a hypo-metabolic state (Young and Taylor, 1998). Perez *et al.* (2005) reported that metabolic effects of meditation include a decreased adrenocortical activity and long term decreased cortisol and thyroid stimulating hormone secretions. This hormonal imbalance in turn may also affect glucose homeostasis and alter lipid profile. Oxidative stress refers to a serious imbalance between oxidant production and anti-oxidant defenses, resulting in oxidative damage of target macromolecules such as DNA, protein and lipid structures (Halliwell; 1994). By products of oxidation reaction are regularly measured as indicators of oxidative stress since free radicals themselves are unstable because of their high

reactivity and short half life. Investigation of lipid peroxidation is the oldest determination of oxidative stress. Malondialdehyde (MDA) is extensively detected as parameter of lipid peroxidation (Valko; 2007). The antioxidant system is composed of antioxidant enzymes as well as endogenous non-enzyme antioxidants. The most important endogenous antioxidant (non-enzyme) is whole blood total thiols (sulfhydryls, which include-glutathione, homocysteine, cysteine and cysteinyl- glycine). These are the powerful reducing agents capable of acting as antioxidant in vivo. Reduced level of plasma MDA with increase total blood thiols were observed in subjects practicing Sahaja Yoga, in the present study. Significant decrease in MDA levels in subjects practicing Sahaja Yoga (Maini, 2000). Kim *et al.* (2005) studied the effect of Zen Meditation on serum nitric oxide activity and lipid peroxidation, and reported a significant increased level of serum nitrate+nitrite concentration and a reduced level of serum MDA than the control group. From these observations, it can be suggested that meditation leads to a decrease in oxidative stress, which in turn reduces lipid peroxidation and increases total blood thiols.

Conclusion

Non pharmacological methods like yogic asanas, pranayama, and meditation should be encouraged to control the modifiable risk factors by increasing parasympathetic activity and decreasing sympathetic activity and provides significant improvements in cardiovascular parameters and respiratory functions. It can thus be concluded that these results would justify the incorporation of yoga as part of our life style in prevention of hyper-reactivity to stress related disorders and age-related cardiovascular complications. “In a tension-filled society, yoga, pranayama, and meditation alone will bring solace from problems and hence they are essence of the life”. The findings conclude that Sahaja Yoga had enhanced the antioxidant defense mechanism in healthy individual by reducing oxidative stress.

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