

योग चिकित्सा शिक्षा एवं अनुसंधान उन्नत केन्द्र

ADVANCED CENTRE FOR YOGA THERAPY,  
EDUCATION & RESEARCH (ACYTER)

(A collaborative venture between JIPMER, Puducherry & MDNIY, New Delhi)



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**SOME THOUGHTS ON YOGA RESEARCH#**

Yoga research is now a global phenomenon with an increased number of blinded, randomized and controlled trials. There is ample evidence of improved planning and implementation with a better understanding of the mechanisms by which various yoga practices cause their effects. More research studies are being published in indexed journals with peer review, indicating a better standard of research at least at the physical level. Greater funding is also available nowadays both nationally and internationally.

Today, however, we are really at the crossroads with important questions such as “How do we really look into the deeper aspects of yoga” cropping up more and more often. We are confronted with the stark reality that we really don't have the equipment, techniques and expertise to study the yogic phenomena as most of them are beyond the physical realm. To conclude that shavasana has only the physical effect of lowering heart rate and blood pressure is to sight merely the iceberg's tip, missing the other 90%. The real effects of shavasana as the ultimate relaxation and true renunciation may have far-reaching effects than we are led to believe.

Many excellent papers are published from a scientific perspective, but are limited from a yogic perspective. There has to be a symbiotic relationship between yoga and modern science. For this, bridges combining the best of both worlds need to be cultivated. Youngsters who have a good grounding in yoga from childhood and those who are living a life of yoga need to take up scientific studies to actualize their potential of being the perfect yoga researchers. Similarly scientists who study yoga, need to remember that yoga is not a subject to be merely 'studied' but is a way of life to be observed as implied by “*Atha yoganushasanam*”, the very first sutra in the Yoga Darshan of Maharishi Patanjali.

In this issue we take a look at the extensive work done at JIPMER in the past few decades under the direction of Prof Dr Madanmohan and an update on studies being conducted by ACYTER at JIPMER as a collaborative venture with MDNIY, New Delhi.

We hope that this issue of the ACYTER bulletin will stimulate many like minded scientists to explore yoga in a wholistic manner and provide a scientific understanding of its great preventive and therapeutic potential.

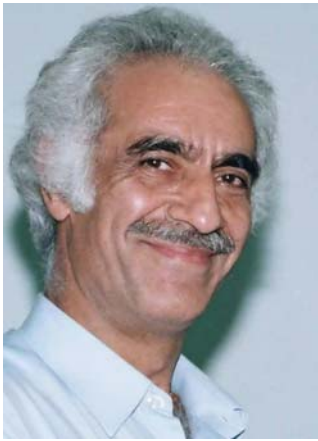
Dr Ananda Balayogi Bhavanani  
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# Bhavanani AB. IJYT 2011; 21: 21

## **ROLE OF YOGA IN PREVENTION AND MANAGEMENT OF CARDIO-VASCULAR DISEASE: THE JIPMER EXPERIENCE\***

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Non-communicable diseases, including cardiovascular diseases comprise more than 60% of health problems and are a major burden on our health care delivery system. In developed countries, cardiovascular disease accounts for 30% of all cause mortality and the incidence is more among the elderly.

India is catching fast with an alarming increase in the incidence of hypertension and coronary artery disease. It is a matter of great concern that young Indian professionals who are at the peak of their life and career are becoming victims of cardiovascular diseases. In spite of awesome advances in modern medicine, globally millions die of cardiovascular diseases every year. Allopathy depends on powerful drugs that have many undesirable side effects, especially when administered over a period of time. Many hypertensives and heart patients have to take prolonged drug treatment with the consequent financial burden and undesirable side effects.

It needs to be emphasized that Allopathy does not have all the answers for chronic, degenerative disorders whose incidence is rising by the day. Being high-tech and expensive, modern medicine has not been able to deliver health care to large sections of our population. State-of-the-art technology and expensive medicine automatically limits the reach of modern medicine. Allopathy has not been able to prevent and cure lifestyle-based chronic degenerative disorders that are the bane of modern society and impose significant morbidity and mortality.

It is clear that there is a pressing need for introducing yoga as an add-on, complimentary system to augment modern medicare. Modern medicine as well as yoga have sound scientific basis and are, therefore, natural allies. Their merger will give us an enlightened, holistic and highly effective health care delivery system that will be a boon to our society.

Cardiovascular disease is basically a lifestyle disorder. Hence, lifestyle modification along with usual medicare should be adopted as the strategy for its prevention and management. The goal of lifestyle modification should be to modify risk factors and improve quality of life so that the need for drugs and interventional procedures is significantly reduced. Holistic science of yoga is the best lifestyle ever designed. Yoga is holistic because it has preventive, promotive as well as curative potential and is an ideal means to improve our physical, mental as well as spiritual health.

The ancient marvel of yoga is the eternal and priceless gift of India to the world. Yoga means union. Union between our body, mind and soul and the ultimate union of our individual consciousness with the universal Divine Consciousness in a super-conscious state called Samadhi. Yoga is a scientific – spiritual discipline and the most precious gem of Indian cultural heritage and Vedic thought. It has non-sectarian approach and is for the whole humanity. Indian yogic tradition is pre-historic. The first book of humankind, Rigved,

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mentions about yogic meditation by the wise (5:81:1). Yajurved exhorts us to practice yoga for enhancing mental health, physical strength and prosperity (11:14). That is an ideal recipe against stress and chronic disorders including cardiovascular disease. Upanishads are replete with yogic concepts and Bhagavadgita (~3000BC) mentions the term yoga 105 times in its 700 verses. In unequivocal turns, yogeshwar (lord of yoga) Krishna emphasizes the superiority of a yogi (Bhagavadgita 6:46).

Scientific literature on the role of yoga in prevention and management of cardiovascular diseases is scanty. Yoga has preventive, curative as well as rehabilitative potential. This holistic action of yoga can be explained on the basis of its ability to modulate autonomic functions, relieve stress, improve physiological functions including cardio-respiratory fitness and improve quality of life.

Hypertension and coronary artery disease are common disorders and many patients are on life-long medication as a way of life. To reduce the drug dosage and improve general health and quality of life, yoga should be introduced along with usual medical care. If diagnosed early, most of the patients having essential hypertension/pre-hypertension can be managed effectively by yoga alone. Even in advanced cases, yoga can improve quality of life and decrease drug dosage. Yoga is safe, effective, inexpensive and it improves overall health.

In a study on patients having essential hypertension, we have demonstrated that yoga training produces a significant decrease in blood pressure and heart rate within 3 weeks of the training (Vijayalakshmi et al, *Ind J Physiol Pharmacol* 2004, 48: 59-64). In this study, we have also found that yoga training optimizes the sympathetic response to stressful stimuli like isometric handgrip test. Other workers (Patel and North, *lancet* 1975, 19: 93-95; Datey et al, *Angiology* 1969, 20: 325-333) also have reported blood pressure lowering ability of yoga training.

For best results, yogic lifestyle should be adopted early in life since atherosclerotic plaques in coronary arteries start forming early in life. Moreover, in a recent report, we have found that the levels of LDL and total cholesterol are higher in prehypertensive patients as compared to normal subjects (Pavithran et al, *Indian J Physiol Pharmacol* 2007, 51: 96-98).

Breathing exercises and relaxation training have beneficial effects in patients with previous myocardial infarction (van Dixhoom, *Biol Psychol* 1998, 49: 123-135). This supports our earlier finding that shavasana (yoga relaxation training) and pranayama (yoga breathing) is beneficial in patients having premature ventricular complexes and palpitations (Ravindra et al, *International J Cardiology* 2006, 108:124-125).

In a recent work, we have demonstrated that pranayama breathing at 6 breaths/min can reduce heart rate and blood pressure of hypertensive patients within 5 mins of starting the practice (Bhavanani et al, *International J Yoga Therapy* 2011, 21: 73-76). This novel finding has potential therapeutic application in day-to-day as well as clinical situations where blood pressure needs to be brought down quickly. We recommend that this simple to perform and inexpensive technique be added to the management protocol of hypertensive patients as an add-on to the routine medical care.

Therapeutic potential of yoga may be due to, at least partly, its ability to modulate autonomic function. In a study on the effect of pranayama on school children, we have demonstrated that three month pranayama training produce a decrease in basal sympathetic tone, an increase in basal parasympathetic activity and a significant decrease in rate pressure product (Udupa et al, *Indian J Physiol Pharmacol* 2003, 47: 27-33). Rate-pressure product is an index of load on heart and myocardial oxygen consumption. These findings indicate that pranayama has potential benefit in health and disease.

In another study, we have demonstrated that six week yoga training improves thermo-regulatory efficiency as measured by weight loss response to step test (Madanmohan et al, *Indian J Physiol Pharmacol* 2008, 52: 164-170). This yoga training induced attenuation of

sweating response to muscular exercise is of physiological significance and indicates improved autonomic regulation and exercise tolerance. Our findings support those of Michalsen et al (Am Heart J 2006, 151: 870-877) who have reported that comprehensive lifestyle modification improves autonomic function, angina and quality of life of patients with established coronary artery disease.

Stress is an important factor in the etiology as well as progression of chronic diseases including hypertension and coronary artery disease. For prevention as well as management of stress, there is no method as effective and far-reaching as yoga. Shavasan, meditation and mantra chanting are very effective in controlling stress.

Yogic postures, when performed with awareness and synchronized with breathing as well as slow, rhythmic pranayams are effective stress busters. In a study on subjects who were well trained in yoga, we have demonstrated that savitri pranayam (slow rhythmic and deep breathing with a ratio of 2:1:2:1 between inspiration, hold-in, expiration and hold-out phases) and shavasan produce a significant decrease in oxygen consumption and a deep psychosomatic relaxation within 5 minutes of starting the practice (Madanmohan et al, The Yoga Review 1983, 3: 25-34).

In another study, we have demonstrated that shavasan improves one's ability to withstand stress as measured by response to cold-pressor test and this ability can be achieved within 7 days of training (Madanmohan et al, Indian J Physiol Pharmacol 2002, 46: 307-312). Our findings are consistent with the report that yoga training not only produces a significant decrease in basal anxiety level, but also attenuates the increase in stress scores during stressful situations like examinations (Malathi and Damodaran, Indian J Physiol Pharmacol 1999, 43:218). It is clear that yoga is very effective in combating stress and stress disorders like hypertension and coronary artery disease.

The beneficial health-promoting and therapeutic effects of yoga training can also be due to improvement of physiological functions. Practice of pranayam and asan results in improvement of physical fitness and cardio-respiratory endurance. In a work on normal school going boys, we have found that yoga training blunts the exercise-induced increase in heart rate and blood pressure (Madanmohan et al, Indian J Physiol Pharmacol 2004, 48: 461-465). This suggests that yoga training improves exercise tolerance. In an another work conducted on medical students, we have found that 12 week yoga training produces a significant increase in respiratory pressures, handgrip strength and breath holding time, suggesting an improved physical strength and cardio-respiratory function.

Yoga training also improves respiratory endurance, muscle strength and reaction time (Madanmohan et al, Indian J Physiol Pharmacol 1992, 36: 229-233). Improvement of pulmonary functions by yoga training has also been reported by us (Madanmohan et al, Indian J Physiol Pharmacol 2003, 47: 387-392).

We have also reported that training in slow breathing pranayams (e.g. savitri pranayam) reduces the basal heart rate and rate-pressure product while training in fast breathing pranayams (e.g. bhastrika) produces an increase in these parameters. Thus, it is possible that slow and fast pranayams may have different therapeutic effects.

Our studies demonstrate the health promoting and therapeutic potential of yoga. Yoga can play a significant role in prevention as well as management of cardiovascular disease, especially essential hypertension and coronary artery disease, whose incidence is increasing alarmingly. Yoga is the mantra for "avoidable attributes" of ageing.

## CURRENT YOGA RESEARCH ACTIVITIES AT JIPMER

Various studies are being conducted at JIPMER as collaborative efforts between ACYTER and the Departments of Physiology, Medicine, Biochemistry, Cardiology, Obstetrics and Gynecology. Papers and abstracts have been published on the completed studies and also submitted for publication. Details of the various studies that have been completed / in progress are given below along with details of the papers published and those in press.

### PhD theses:

#### In Progress:

1. Effect of yoga therapy on cardiac autonomic functions and oxidative stress in prehypertensive subjects: a randomized controlled study.
2. Effect of yoga therapy on cardiac function, response to exercise, oxidative stress and quality of life in heart failure patients: a randomized controlled trial.

### MD dissertations:

#### Completed:

1. Effect of 12 week yoga therapy as a lifestyle intervention in patients of type 2 diabetes mellitus with distal symmetric polyneuropathy – A randomized controlled study. **Dissertation submitted.**
2. Effect of yoga therapy on cardiac autonomic function in patients of essential hypertension – A randomized controlled study. **Dissertation submitted**

#### In Progress:

1. Effects of slow and fast pranayams on pulmonary function, handgrip strength and endurance in young healthy volunteers – A randomized controlled trial.
2. Effect of yoga training on autonomic functions and reaction time in young healthy females during different phases of menstrual cycle.
3. Effect of pranayam on maximal exercise performance, pulmonary function, recovery heart rate and blood pressure in healthy adults.

### MSc dissertations:

#### Completed:

1. Effect of yoga training on heart rate, blood pressure and lipid profile of patients with essential hypertension. **Paper has been submitted for publication**
2. Effect of yoga training on reaction time, blood glucose and lipid profile of female diabetes mellitus patients. **Paper has been accepted for publication**
3. Effect of yogic training on physical and biochemical variables of type 2 diabetes mellitus patients. **Dissertation submitted.**

### PILOT STUDIES:

#### Completed:

1. Immediate effect of sukha pranayama on heart rate and blood pressure of patients with hypertension. **Paper has been published in International Journal of Yoga therapy 2011; 21: 73-76.**
2. Immediate cardiovascular effects of kaya kriya in normal healthy volunteers. **Abstract of the study published in ACYTER bulletin, workshop proceedings and compilations.**

3. Immediate effect of shavasana and savitri pranayama on heart rate and blood pressure of hypertensive patients. **Abstract of the study published in ACYTER bulletin, workshop proceedings and compilations.**
4. Immediate effect of chandra nadi pranayama on heart rate and blood pressure of hypertensive patients. **Abstract of the study published in ACYTER bulletin, workshop proceedings and compilations. Full paper has been submitted for publication**
5. Immediate cardiovascular effects of shavasana and pranava pranayama on heart rate and blood pressure of hypertensive patients. **Abstract of the study published in ACYTER bulletin, workshop proceedings and compilations.**
6. Immediate effects of yoga nidra on heart rate and blood pressure. **Abstract of the study published in ACYTER bulletin, workshop proceedings and compilations.**
7. Immediate effect of yoga practices on blood pressure. **Work and data analysis completed.**
8. Immediate cardiovascular effects of pranava pranayama in hypertensive patients. **Paper has been submitted for publication.**
9. Immediate effect of suryanadi pranayam on heart rate and blood pressure of hypertensive patients. **Work and data analysis completed**
10. Immediate effect of suryanadi and chandranadi on short term heart rate variability in healthy volunteers. **Data analysis completed and abstract of the study sent for publication and presentation at APPICON 2011.**

#### **In Progress:**

1. A pilot study on acute effect of anulom vilom pranayam on heart rate variability in healthy volunteers. **Work and data analysis completed and more patients are being recruited**
2. Immediate effect of 5 minutes chandranadi pranayam on heart rate variability in hypertensive patients. **Work and data analysis completed and more patients are being recruited**
3. Immediate effect of 5 minutes chandranadi pranayam on heart rate variability in Diabetes mellitus patients. **Work and data analysis completed and more patients are being recruited**
4. Acute effect of 5 minutes chandranadi pranayam on heart rate variability in patients with diabetes mellitus and hypertension. **Work and data analysis completed and more patients are being recruited**
5. Immediate effect of 5 minutes chandranadi pranayam on heart rate variability in patients of heart failure. **Work and data analysis completed and more patients are being recruited**
6. A pilot study on effect of respiratory rate on heart rate variability in healthy volunteers.
7. Effect of yoganidra on short term HRV in heart failure patients.

#### **CASE STUDIES:**

##### **Completed:**

- Effect of yoga on subclinical hypothyroidism. **Full paper was published in Yoga Mimamsa 2011; 43: 102-107.**
- Effect of yoga in newly diagnosed hypertension. **Abstract of the study published in ACYTER bulletin.**

- Effect of yoga in a patient of long standing diabetes and hypertension. **Abstract of the study published in ACYTER bulletin.**
- Case report on COAD in an adult. **Abstract of the study published in ACYTER bulletin.**
- Case report on bronchial asthma in a 4 year old child. **Abstract of the study published in ACYTER bulletin.**

#### **OTHER RESEARCH PROJECTS:**

##### **Completed:**

Patient Feedback Survey and Retrospective Wellness Questionnaire was completed for 100 patients in June 2011 and published in ACYTER bulletin of July 2011.

##### **In progress:**

1. Effect of slow and fast pranayams on cognitive and autonomic parameters in young healthy subjects.
2. Effect of mid trimester yoga on the incidence of preeclampsia in high risk women. The clinical trial is being conducted in collaboration with the Department of Obstetrics and Gynecology with Dr K Manikandan, Asst Professor as Principal Investigator. The trial has been registered as CTRI/2011/10/002064 with Clinical Trials Registry- India (CTRI), hosted at the ICMR's National Institute of Medical Statistics (NIMS).

#### **PUBLICATIONS:**

1. Effect of yoga on subclinical hypothyroidism: a case report. *Yoga Mimamsa* 2011; 43: 102-107.
2. Immediate effect of sukha pranayama on cardiovascular variables in patients of hypertension. *International Journal of Yoga therapy* 2011; 21: 73-76.
3. Don't put yoga in a small box: The challenges of scientifically studying yoga. Perspective by Ananda Balayogi Bhavanani. *International Journal of Yoga therapy* 2011; 21: 21.
4. A comparative study of slow and fast suryanamaskar on physiological function. *International Journal of Yoga* 2011; 4 (2); 71-76
5. Effects of a comprehensive six week yoga therapy programme on reaction time and biochemical parameters and wellness score of peri and post menopausal diabetic patients. Accepted for publication in the *International Journal of Yoga*.
6. Role of yoga in managing bronchitis. Accepted for publication in *Journal of Alternative and Complementary Medicine*.
7. Immediate effect of mukha bhasrika (a bellows type of pranayama) on reaction time in special children. Accepted for publication in *Indian Journal of Physiology and Pharmacology*.
8. Immediate cardiovascular effects of pranava pranayama in hypertensive patients. Submitted to the *Indian Journal of Physiology and Pharmacology*.
9. Effects of a comprehensive eight week yoga therapy programme on cardiovascular health in patients of essential hypertension. Submitted to the *International Journal of Yoga therapy*.

10. Immediate effect of chandra nadi pranayama (left unilateral forced nostril breathing) on cardiovascular parameters in hypertensive patients. Submitted to the International Journal of Yoga.

### **YOGA THERAPY OPD AT SUPERSPECIALITY BLOCK**

Yoga therapy OPD is functioning regularly in Super Specialty Block of JIPMER. Yoga therapy and lifestyle consultation is given by Dr Ananda Balayogi Bhavanani and Dr Zeena Sanjay from 10 AM to 1 PM on Monday, Wednesday and Friday and 10 AM to 4 PM on Tuesday and Thursday. 441 patients (new 334 and old 107) of various disorders attended the OPD between July and October 2011.

### **YOGA RESEARCH LAB AT SUPERSPECIALITY BLOCK**

ACYTER Yoga Research Lab is functioning in SS Block since 6 July 2011 and regular studies are being done on patients of diabetes, hypertension and heart failure along with the administration of questionnaires. Various pilot studies on patients as well as normal volunteers are being conducted by Sri E Jayasettiaseelon, SRF in coordination with Sri Harikrishna, PhD Scholar and Dr M Rajajeyakumar, SR, Department of Physiology.

### **YOGA THERAPY SESSIONS**

The yoga therapy sessions are being conducted at ACYTER yoga hall on Mondays, Wednesdays and Fridays from 10 – 11 AM for patients of diabetes, 11 AM – 12 noon for patients of cardiovascular diseases and 12 noon – 1 PM for patients of other disorders. Additional sessions are being conducted on Tuesday, Thursday and Saturday from 10 – 11 AM for patients of diabetes. The yoga instructors, Shri G Dayanidy and Selvi L Vithiyalakshmi are conducting the sessions both individually and in groups as per directions of the therapists. Patients have reported satisfaction with the therapy sessions and are attending regularly. 654 patients of diabetes, 514 of hypertension and 635 of other conditions attended these sessions between July and October 2011.

### **YOGA CLASSES FOR NORMAL SUBJECTS**

Yoga classes are being conducted on Mondays, Wednesdays and Fridays at 6.30 AM and 4.30 PM. 637 participants attended the classes in the last quarter. Suryanamaskar, basic asanas, pranayamas and relaxation techniques are being taught in the classes.

### **YOGA CLASSES FOR SENIOR CITIZENS**

Yoga classes for senior citizens are being conducted every Thursday between 11 AM and 12 noon. 138 participants attended classes with Mrs. Meena Ramanathan, Guest faculty who is Coordinator, Yoga Centre, Mahatma Gandhi Medical College and Research Institute.

<b>From</b> <b>Advanced Centre for Yoga Therapy, Education and Research (ACYTER) III floor Institute Block, JIPMER, D Nagar Puducherry – 605 006</b>	<b>To</b>
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