



Proceedings of the  
National Workshop-cum-Seminar  
on



**ROLE OF YOGA IN  
PREVENTION AND MANAGEMENT OF  
DIABETES MELLITUS**

**1 & 2 March 2011**

*Organized by*

**Advanced Centre for Yoga Therapy, Education & Research, (ACYTER)  
& Department of Physiology, JIPMER, Puducherry**

*in collaboration with*

**Morarji Desai National Institute of Yoga (MDNIY), New Delhi**  
(An autonomous organisation under Department of AYUSH, Ministry of Health and Family  
Welfare, Government of India, New Delhi)



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## **FROM THE DESK OF THE ORGANIZING CHAIRMAN**

At the outset, I wish to express my heartfelt thanks to the Secretary AYUSH, Ministry of Health and Family Welfare, Govt. of India, New Delhi for giving me the opportunity and honour to organize this national workshop-cum-seminar on “Role of Yoga in Prevention and Management of Diabetes Mellitus”. Dr. Ishwar V Basavaraddi, Director, Morarji Desai National Institute of Yoga (MDNIY), New Delhi motivated me to organize this national workshop-cum-seminar. He and the staff of Morarji Desai National Institute of Yoga have offered unconditional support to organize this workshop.

I am grateful for the encouragement and support of Professor KSVK Subba Rao, Director, JIPMER who inaugurated the workshop and set the tone for its success. I thank Professor Ashok Kumar Das, Medical Superintendent, JIPMER, whose active participation in the workshop inspired the delegates. Professor S Badrinath, Project Coordinator and Professor KS Reddy, Dean have been a source of support for organizing this workshop. I am grateful to the distinguished faculty of the workshop who readily responded to my invitation at a very short notice.

I thank my colleagues and friends from the Department of Physiology, ACYTER and other departments of JIPMER who were of great help in organizing this workshop. Organizing Secretary, Professor GK Pal made extra efforts to manage the scientific programme. Special thanks are due to Yogacharya Dr Ananda Balayogi Bhavanani, Programme Coordinator, ACYTER for coordinating the workshop and for compiling the proceedings. Thanks are due to Dr. Zeena Sanjay, SRF, ACYTER for her help in compiling and proof reading the proceedings.

It is a matter of great satisfaction that the workshop was conducted in a fitting manner and to the satisfaction of delegates and the faculty. Lectures were of high quality and demonstrations were educative and useful. The practice sessions were the highlight of the workshop and were well received by the participants who expressed their satisfaction at being able to learn the important practices in such a short time.

I am very happy to bring out the proceedings and hope that its contents will be useful to the readers and motivate them to conduct similar seminars and workshops on therapeutic applications of yoga leading to the integration of the science of yoga with modern medicine.

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## **REPORT ON THE WORKSHOP-CUM-SEMINAR**

The Advanced Centre for Yoga Therapy, Education and Research (ACYTER) and the Department of Physiology, JIPMER organized a two day National Workshop-cum-Seminar on “Role of Yoga in Prevention and Management of Diabetes Mellitus” on 1 & 2 March, 2011 at JIPMER. The workshop was organized in collaboration with Morarji Desai National Institute of Yoga (MDNIY), New Delhi, an autonomous organization under the Department of AYUSH, Ministry of Health and Family Welfare, Govt. of India. More than 200 medical, paramedical and yoga professionals and yoga enthusiasts from all over the country participated along with 100 medical students of JIPMER and 40 faculty, residents and staff members of the Department of Physiology and ACYTER, JIPMER.

The workshop was inaugurated by Dr KSVK Subba Rao, Director JIPMER and Dr BK Sahay, eminent diabetologist was the guest of honour. Senior faculty members from various departments of JIPMER as well as eminent yoga and medical experts from all over the country participated.

The workshop deliberated on the role of yoga in the prevention and management of diabetes with keynote lecture, invited talks, lecture-demonstrations, panel discussions and practice sessions that were given by a team of 30 resource persons from JIPMER; DIPAS; AIIMS; Viniyoga Healing Foundation, Chennai; The Yoga Institute, Mumbai; Iyengar Yogashraya, Pune; Antar Praksh Yoga Centre, Haridwar; KMC Mangalore; Vinayaka Mission’s Medical College, Salem; Vivekananda Institute of Yoga Therapy, Karur; PGIBMS, Taramani, Chennai and the International Centre for Yoga Education and Research, Pondicherry.

Faculty from JIPMER included Dr AK Das, Medical Superintendent, Dr Madanmohan, Professor and Head, Department of Physiology and Programme Director ACYTER (Organizing Chairman of the workshop) and Dr GK Pal, Professor, Department of Physiology (Organizing Secretary of the workshop). Dr Zeena Sanjay, Sri E Jayasettiaseelon, Sri G Dayanidy and Selvi L Vithiyalakshmi from ACYTER. Smt Lalitha Shanmugam, Smt Devasena Bhavanani and Smt Meena Ramanathan from Yoganjali Natyalayam assisted in the conduct of practice sessions under guidance of Dr Madanmohan and Dr Ananda Balayogi Bhavanani (Coordinator of the workshop).

The first day of the workshop started with the inaugural function presided over by Dr KSVK Subba Rao, Director JIPMER in the presence of Dr AK Das, Medical Superintendent and Dr KS Reddy, Dean, JIPMER. The Guest of Honour for the inaugural ceremony was Dr BK Sahay, former president of API and eminent diabetologist. After the traditional lighting of the inaugural lamp and honoring of the dignitaries, the organizing chairman of the workshop, Dr Madanmohan delivered the welcome address. In his welcome note he stressed on the importance of yoga in modern medicine and also insisted to start practicing yoga regularly from an early age.

Dr AK Das, Medical Superintendent, JIPMER then released a compilation of research studies on yoga and diabetes for educational purposes that had been compiled by ACYTER. Dr AK Das then addressed the gathering saying “Today we all are witnessing a tsunami of diabetes mellitus”. He added that every 3<sup>rd</sup> or 5<sup>th</sup> person in India is diabetic and emphasized that our focus should be on proper diet, lifestyle modification and attitude. “By yoga and lifestyle modification we can over write the emphasis of genes and conquer this non communicable disease”. Dr KS Reddy, Dean, JIPMER then released a booklet on Yoga and Diabetes in Tamil that had been compiled by ACYTER. He said that diabetes mellitus is an important non communicable disorder, a silent killer and India is fast becoming the diabetic capital of the world with more than 5 crore diabetics. Diabetes affects most systems of the body and the practice of yoga may delay the onset and progression of diabetes.

Dr BK Sahay, Guest of Honor released a booklet on Yoga and Hypertension in Tamil that had been compiled by ACYTER following which he gave his special invited address. Yoga is a science and it is part of the rich heritage of our culture. Diabetes appears even in the younger age and we should start a war to reverse this trend. He said that we can and we should concentrate with all our resources to prevent this massive epidemic of diabetes. He outlined the main causes of diabetes such as genetic factors, stress, unhealthy lifestyle, dietary habits as well as lack of physical activity. Promoting yoga across the country with proper and judicious usage of its techniques can help treat and prevent diabetes.

Dr KSVK Subba Rao released the Proceedings of the “National Workshop-cum-Seminar on Role of Yoga in Prevention and Management of Hypertension” that had been compiled from the National Workshop organized by ACYTER at JIPMER in 2010. In his inaugural address,

he appreciated the excellent work being done by ACYTER at JIPMER under the dynamic guidance of Dr Madanmohan and thanked Director MDNIY, New Delhi for initiating this collaborative venture between MDNIY and JIPMER. Diabetes is affecting so many in our country irrespective of gender, religion and economic status. He said that yoga has a major role to play in controlling diabetes and should be practiced in daily life. More rigorous scientific studies need to be done to validate its potential benefits and to make it more acceptable to the scientific and medical community worldwide. The inaugural function ended with a vote of thanks proposed by Dr GK Pal, Professor Dept of Physiology, JIPMER and Organizing Secretary of the workshop.

The first scientific session of the day was chaired by Dr Vasudev Anand Rao, Professor and Head, Department of Ophthalmology, JIPMER. The invited speakers in the session were Dr BK Sahay, Dr AK Das and Dr Madanmohan. Dr BK Sahay's presentation was on the "Role of Yoga in Diabetes Mellitus". He detailed the extensive studies carried out to assess effects of yogic practices in treatment of patients of diabetes mellitus, hypertension, obesity, bronchial asthma as well as in normal individuals at Vemana Yoga Research Institute, Secundrabad. On the basis of their research studies, he suggested that dhanurasana, ardhmatsyendrasana, halasana, vajrasana, bhujangasana, naukasana are most effective in diabetes patients while yogamudrasana and shalabasana seem to worsen the condition. He concluded that the practice of yoga improves metabolic control and insulin sensitivity and also has beneficial effects on lipid metabolism. It helps control hypertension, improves exercise tolerance and prevents long term complications of diabetes. Most patients report improved subjective feeling of wellbeing and it is also useful in patients with secondary failure to oral hypoglycemic agents.

The second invited talk of the day was by Dr AK Das who gave an illuminating presentation of "Diabetes Mellitus as a Lifestyle Disease". He explained about the history of diabetes detailing the global nature of the disorder that has seen 171 million diabetic patients worldwide with a prediction of the number becoming 366 million by 2030. He stressed that the major impact of the disorder was found in South East Asia and the West Pacific. He stated that diabetes is the 4<sup>th</sup> leading cause of death globally and that 4 diabetics are detected every minute across the globe. 20% of the world's diabetic population is in India! He

suggested that yoga has a major role to play in tackling diabetes as it is cost effective, feasible, not complex, and culturally acceptable. The importance of genetic factors and low birth weight in the causation of diabetes as well as the occurrence at a younger age due to lack of physical activity and obesity in children were highlighted by him. He concluded by saying that the key to prevent diabetes mellitus was to maintain healthy body weight, take healthy diet and exercise at least 30 min for 4-5 days/ week.

Dr Madanmohan, Programme Director ACYTER and Head, Department of Physiology gave an enlightening talk on components of yogic diet and its importance in prevention and management of diabetes. The healthy nature of fresh, holistic, nourishing satvik diet and the hazards of a junk food based tamasic diet were highlighted.

The afternoon session started with a lecture-cum-demonstration by Dr N Chandrasekharan, founder director of Viniyoga Healing Foundation, Chennai. The session was chaired by Professor Srikumari Srisailapathy from Chennai. Dr Chandrasekaran detailed the panchakosha concept and said that yoga therapy could be divided into 4 parts: sharirika chikitsa, pranika chikitsa, indriya chikitsa and mano chikitsa. He said that the main principle in yoga therapy is samanam working at primary level and shodhanam working at a higher level. He detailed the different types of agni and prana while his colleague demonstrated the variations of jataraparivrattha that works on normalization of agni.

Dr Prakash C Malshe from Haridwar gave a lecture-cum-demonstration on “Yoga modalities for the therapy and prevention of diabetes mellitus” and gave a three point outline of how yoga can be effective in diabetes. These included measure to control obesity, measures to control cholesterol and measures to improve beta cells function. He suggested that mithahara with fasting helps induce secretion of hormone sensitive lipase (HSL) making it easier to derive energy from the stored fat on the day of fast. He also suggested that inverted postures help to release atrial natriuretic peptide (ANP) that is a stimulus for HSL. His hypothesis that air filling maneuvers create a sense of satiety making it easier to tolerate hunger and that suryanamaskar is designed to fill the digestive tract with air by using kaki mudra were interesting. He also suggested that intermittent hypoxia produced by nishsheha rechaka pranayama induces a state of hypoxia resulting in proliferation of stem cells and beta cells. His suggestion to control peripheral neuropathy included persistent effortful contraction of

peripheral muscles in various asanas to promote maintenance and growth of neurons in peripheral nerves.

The panel discussion that followed after tea was chaired by Dr PH Ananthanarayanan, Professor and Head, Department of Biochemistry and coordinated by Dr Vijayalakshmi, Professor of Physiology, JIPMER. The eminent panel members were Dr Shantharam Shetty, Dr Prabha Adhikari, Dr G Himashree, Dr Srikumari, Dr V Anantharaman, Dr Vivek Kumar Sharma and Dr S Velkumary. Dr Shantharam Shetty presented the details of the research programme, “The Caring Heart Project” based on lifestyle management for reversal of coronary artery disease that was conducted at the Yoga Institute, Santacruz, Mumbai in collaboration with the Nair and Leelavati Hospital. It was a randomized control study that showcased yoga’s ability to control sympathetic overdrive thus mimicking beta blockage while producing lipid lowering and plaque stabilizing effects. Dr Praba Adhikari elaborated on the effect of yoga on oxidative stress and inflammation in type 2 diabetes. Prof. CR Srikumari Srisailapathy gave a presentation on “Nature and Nurture in Diabetes –a Geneticist’s Perspective about the Yogic Approach”. She elaborated the types of nutritional problems and genes implicated in diabetes and concluded that though our genes are our data card, the adoption of a yogic lifestyle can produce change in gene expression. Dr G Himashree’s talk focused on a physiological view of yoga and its potential in diabetes mellitus. She emphasized that lifestyle modification need to be adopted from childhood itself with emphasis on vegetarian diet coupled with regular physical activity, avoidance of tobacco and alcohol along with reduction in mental stress through yoga. Dr V Anantharaman stated that yoga is effective in increasing the motor and sensory nerve conduction in diabetes along with a quicker relaxation of muscles. He said that yoga can improve the recovery period, keep the mind calm and relieve pain. Dr Vivek Kumar Sharma’s short presentation focused on research work done at JIPMER with regards to yoga and autonomic functions. Dr S Velkumary gave a presentation on the role of yoga in prediabetes.

The afternoon session concluded with a practice session led by Dr Madanmohan, Dr Ananda Balayogi, Dr R Murugesan, Sri G Dayanidy and Sri E Jayasettiaseelon focusing on yoga techniques useful in prevention and management of diabetes. A team of yoga experts



including Smt Devasena Bhavanani, Smt Lalitha Shanmugam, Smt Meena Ramanathan, Dr Zeena Sanjay, Selvi L Vithiyalakshmi, Dr Navasakthi and Dr Loganathan assisted.

On the evening of the first day, the delegates were treated to a spectacular cultural programme that was a fusion of yogasana tableaux, Bharatanatyam compositions and instrumental music that was presented by Yoganjali Natyalayam under the dynamic direction of Kalaimamani Yogacharini Meenakshi Devi Bhavanani, Director of the institute. Dr Ananda Balayogi actively coordinated the performance along with Smt Devasena Bhavanani.

The second day of workshop started with an early morning practice session led by the ACYTER team that reviewed the techniques taught the previous day. The morning academic session started with an excellent keynote talk by Yogacharini Meenakshi Devi Bhavanani, Director ICYER at Ananda Ashram, Puducherry who stressed upon the importance of developing proper yogic attitudes as a means to prevent and manage diabetes. The session was chaired by Dr Santosh Kumar, Professor and Head, Department of Urology, JIPMER. Ammaji, Meenakshi Devi Bhavanani is one of the world's foremost authorities on yoga and her talk was extremely beneficial for all participants as she gave many practical examples from day-to-day life situations.

The panel discussion that followed was chaired by Dr AK Das, Medical Superintendent of JIPMER and moderated by Dr GS Gaur, Addl Professor, Physiology, JIPMER. The panelists were Dr V Srinivasan, Dr Mukta Wyawahare, Dr Varun Malhotra, Dr Vaishali and Dr Nalin Mehta. Dr V Srinivasan highlighted the role of obesity in causation of diabetes and the role of yoga in managing this risk factor. Dr Mukta Wyawahare presented a detailed exposition of the medical perspective on diabetes and its medical management. Dr Varun Malhotra described the beneficial role of yoga in diabetes and quoted from numerous studies that have dealt with yoga and diabetes including his own work on nerve conduction and pulmonary function in diabetes. Dr Vaishali gave a detailed comparison of exercise and yoga and their benefits in patients of diabetes. Dr Nalin Mehta described the work at AIIMS through a comprehensive yoga based intervention for lifestyle disorders including diabetes. This was followed by a practice session led by Dr Madanmohan, Dr Ananda Balayogi Bhavanani, Dr R Murugesan, Sri G Dayanidy and Sri E Jayasettiaseelon. They reviewed the various yoga techniques taught to the participants on the previous day.

The post lunch session started with a stimulating lecture-demonstration by Dr Manoj Naik representing the Iyengar Yogashraya, Mumbai. The importance of inverted postures in normalizing blood glucose was elaborated with quality demonstrations of sarvangasana and shirshasana. He also demonstrated other important asanas like dhanurasana, ardhamatseyandrasana and pashchimottanasana. He was assisted by Sri Bidyadhar Kar who is an Iyengar Yoga teacher based in Pondicherry. After his interactive session, Dr M Madhavan of the Vivekananda Yoga Institute, Karur gave an informative lecture-demonstration highlighting various techniques useful in prevention and management of diabetes. All participants enjoyed the session and an active interaction with questions and answers followed.

The tea break was followed by a group forum that discussed various aspects of the role of yoga in prevention and management of diabetes. This was chaired by Dr IV Basavaraddi, Director MDNIY and coordinated by Dr AK Das, the Medical Superintendent of JIPMER. The panelists were Dr Nalin Mehta, Dr CR Srikumari Srisailapathy, Dr Varun Malhotra, Dr V Srinivasan, Dr Madanmohan, Dr GK Pal, Dr G Himashree and Dr Prakash C Malshe. A lively discussion about various therapeutic modalities of yoga useful in diabetes and the probable mechanisms involved held the audience in rapt attention. It was concluded that an integrated approach of yoga and modern medicine has great potential to restore the health and well being of the diabetic patients. Suggestions were made to research various yoga techniques individually and also bring out research studies, monographs and other scientific compilations highlighting the therapeutic benefits of yoga.

Dr IV Basavaraddi, Director MDNIY was guest of honour for the valedictory function and expressed his appreciation of work at ACYTER, JIPMER. In his special address he extolled the medical community to research yoga in depth with proper adherence to the correct textual basis and proper practice of yoga techniques so that the results were of international quality and acceptable to the modern scientific community. Excellent feedback was received from all participants who expressed their thanks to JIPMER and MDNIY for conducting such a timely and useful workshop that is a need of the hour. The workshop declaration was read out by Lt Col Dr Himashree and the gathering passed the declaration unanimously by a show of hands. The vote of thanks was then delivered by Dr Ananda Balayogi Bhavanani who

expressed gratitude to Director JIPMER, Director MDNIY, invited resource persons and participants of the workshop. He also thanked faculty, residents and staff of Department of Physiology and ACYTER for their whole hearted efforts towards making the workshop such a grand success. The workshop ended with the rendition of the National Anthem by all participants.

### **DECLARATION OF THE WORKSHOP**

National workshop-cum-seminar on “Role of Yoga in Prevention and Management of Diabetes Mellitus”, attended by more than 200 delegates, comprising medical professionals and students, yoga experts and discernible persons from the local town of Pondicherry, has been a grand success. The physiological, pathological, psychological and metaphysical perspectives of prevention and management of diabetes have been deliberated at length and futuristic ideas and plans have also been put forth. We, the organizers, patrons, delegates and all the participants, urge the State Government, Central Government, MCI & Department of AYUSH to evolve a concrete policy for promotion of yoga as an adjunct to modern medicine so that a mass movement for yoga awareness with a sound scientific footing can be initiated.

The workshop proposes the following recommendations with regard to the prevention and management of diabetes mellitus through yoga:

1. The inculcation of yoga has to be not only at the medical level but at the school level if we want to prevent diabetes. We need to concentrate our energies on working at the school level itself and catch them young.
2. Screening for pre-diabetes needs to be intensified and yoga introduced to the pre-diabetics to prevent them from going into full blown diabetes.
3. We need to bring out effective and consensus-based dietary guidelines keeping yogic principles in mind.
4. A universal standardized yoga package needs to be evolved for diabetes so that the diabetic patients all over the world can be benefited in a rational manner.

5. A universal standardized research protocol to scientifically evaluate the effect of yoga on diabetes needs to be evolved with inputs from physicians, researchers and statisticians.
6. Scientific evaluation and standardization of various recommended individual techniques of yoga should be done and documented with publications so that the benefits of the individual practices as well as their combination can be understood in a scientific and rational manner.

## FACULTY OF THE WORKSHOP

1	Dr. Prabha Adhikari, Professor, Department of Medicine, KMC, Mangalore	14	Shri E Jaysettiyaseelon, SRF, ACYTER, JIPMER, Pondicherry
2	Dr. PH Ananthanarayanan, Professor and Head, Department of Biochemistry, JIPMER, Pondicherry	15	Dr Loganathan, WHO Healthy Lifestyle Project, JIPMER, Pondicherry
3	Dr. V Anantharaman, Former Professor, Department of Physiology , Annamalai University and JIPMER	16	Dr Madanmohan, Professor and Head, Department of Physiology and Programme Director ACYTER, JIPMER, Pondicherry
4	Dr. IV Basavaraddi , Director, MDNIY, New Delhi	17	Dr. M Madhavan , Director Vivekananda Institute of Yoga Therapy, Karur, TN
5	Dr Ananda Balayogi Bhavanani, Programme Coordinator, ACYTER, JIPMER, Pondicherry	18	Dr. Varun Malhotra, Professor, Department of Physiology, SVMCM, Salem, TN
6	Smt Devasena Bhavanani, Senior Faculty, ICYER & Yoganjali Natyalayam, Pondicherry	19	Dr. Prakash C Malshe, Consultant Physician and Yoga expert, Haridwar
7	Yogacharini Smt Meenakshi Devi Bhavanani, Director, Ananda Ashram at ICYER & Yoganjali Natyalayam, Pondicherry	20	Dr. Nalin Mehta, Professor, Department of Physiology, AIIMS, New Delhi
8	Dr N Chandrasekaran , Director, Viniyoga Healing Foundation of India, Chennai	21	Dr R Murugesan, Physical instructor, JIPMER, Pondicherry
9	Dr AK Das, Medical Superintendent, JIPMER, Pondicherry	22	Dr. Manoj Naik, Consultant Physician and Yoga expert, Iyengar Yoga Institute, Pune
10	Shri G Dayanidy, Yoga instructor, ACYTER, JIPMER, Pondicherry	23	Dr Navashakthi, WHO Healthy Lifestyle Project, JIPMER, Pondicherry
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12	Dr GS Gaur, Additional Professor, Dept of Physiology, JIPMER, Pondicherry	25	Smt Meena Ramanathan, Co-ordinator, CYTER, MGMC & RI, Pondicherry
13	Lt Col Dr G Himashree, Professor and Head, Department of Physiology, ACMS and OSD, DIPAS, Delhi	26	Dr. Sahay BK, Eminent Diabetologist and Past President API , Hyderabad

27	Dr Zeena Sanjay, SRF, ACYTER, JIPMER, Pondicherry	34	Dr. CR Srikumari Srisailapathy, UGC Research Scientist C, Department of Genetics, PGIBMS, Taramani, Chennai
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32	Dr. Shantharam Shetty, Consultant Physician and Yoga expert, The Yoga Institute, Mumbai	39	Miss L Vithiyalakshmi, Yoga instructor, ACYTER, JIPMER, Pondicherry
33	Dr. V Srinivasan, Former Director-Professor and HOD, Physiology, JIPMER, Pondicherry	40	Dr. Mukta Wyawahare, AP, Department of Medicine, JIPMER, Pondicherry

## LIST OF PARTICIPANTS

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36	Kowsalya V,Msc., Student, Kanchipuram
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57	Phillippa Henning,Student, ICYER, Puducherry
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37	Shri Subburaman K, Dept of Physiology, JIPMER
38	Smt Suseela S, Dept of Physiology, JIPMER
39	Smt Sutha M, Dept of Physiology, JIPMER
40	Smt Tamilarasi M, Dept of Physiology, JIPMER
41	Dr Thenmozhi D, SR, Dept of Physiology, JIPMER
42	Dr Vasudeva Anand Rao, Prof & Head, Ophthalmology, JIPMER
43	Shri Vasudevarajulu, Former Collector, Government of Pondicherry

## ACADEMIC PROGRAMME

**1 Mar 2011**

- 8.00 – 9.00 AM: Registration & breakfast
- 9.30 – 10.00 AM: Inaugural function
- 9.30 – 11.00 AM: Introduction: Dr. Madanmohan  
Keynote address: Dr. BK Sahay  
Special talk: Dr. AK Das: Scientific perspective on DM
- 11.00 AM: Tea break
- 11.15 – 1.00 PM: Workshop-I  
Gr 1: Dr Madanmohan, Gr 2: Dr Ananda,  
Gr 3: Dr Murugesan, Gr 4: G Dayanidy
- 1.00 – 2.00 PM: Lunch
- 2.00 – 3.15 PM: Lecture Demonstration I by Dr. N Chandrasekaran  
Lecture Demonstration II by Dr. Prakash Malshe
- 3.15 – 4.30 PM: Panel discussion I: Yoga Research in Diabetes Mellitus  
Chairperson: Dr .PH Ananthanarayanan  
Moderator: Dr Vijayalakshmi  
Members: Dr. G Himashree, Dr. Prabha Adhikari, Dr. CR Srikumari  
Srisailapathy, Dr. V Anantharaman, Dr. Shantharam Shetty, Dr. Vivek  
Kumar Sharma and Dr. S Velkumary
- 4.30 PM: High Tea
- 5.00 PM: Workshop-II  
Gr 1: Dr Madanmohan, Gr 2: Dr Ananda,  
Gr 3: Dr Murugesan, Gr 4: G Dayanidy
- 6.30 PM: Cultural program by Yoganjali Natyalayam
- 8.00 PM: Dinner

## 2 Mar 2011

- 7.00 – 8.00 AM: Practice session
- 8.00 – 9.00 AM: Breakfast
- 9.00 – 9.30 AM: Yogacharini Meenakshi Devi Bhavanani: Spiritual perspective on DM
- 9.30 – 11.00 AM: Panel discussion II: Yoga therapy in Diabetes Mellitus  
Chairperson: Dr AK Das  
Moderator: Dr GS Gaur  
Members: Dr. Nalin Mehta, Dr. V Srinivasan, Dr. Varun Malhotra, Dr. Vaishali and Dr. Mukta Wyawahare
- 11.00 – 11.15 AM: Tea break
- 11.15 – 1.00 PM: Workshop-III
- 1.00 – 2.00 PM: Lunch
- 2.00 - 3.30 PM: Lecture demonstration III by Dr. M Madhavan  
Lecture demonstration IV by Dr. Manoj Naik
- 3.30 – 4.45 PM: Open Forum  
Chairperson: Dr IV Basavaraddi  
Moderator: Dr AK Das  
Members: Dr Madanmohan, Dr. Nalin Mehta, Dr. V Srinivasan, Dr. G Himashree, Dr. Prabha Adhikari, Dr. CR Srikumari Srisailapathy, Dr. V Anantharaman, Dr. Shantharam Shetty, Dr. Vivek Kumar Sharma and Dr. Varun Malhotra
- 4.45 PM: Tea break
- 5.00 PM: Valedictory function

### Workshop Faculty:

<b>Group 1</b>	<b>Group 2</b>	<b>Group 3</b>	<b>Group 4</b>
Dr Madanmohan	Dr Ananda B Bhavanani	Dr Murugesan	Sri G Dayanidy
Smt Lalitha Shanmugam, Sri Jayasettiaseelon	Smt Devasena Bhavanani, Smt Meena Ramanathan	Dr Navasakthi, Smt Karpagam	Miss Vithiyalakshmi, Dr Zeena Sanjay

## COMMITTEES

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Director, JIPMER

**Dr. IV Basavaraddi**  
Director, MDNIY, New Delhi

### *Patrons:*

**Dr. Ashok Kumar Das**  
Med. Superintendent

**Dr. S Badrinath**  
Project Co-ordinator

**Dr. KS Reddy**  
Dean

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**Dr. Madanmohan**

Professor & Head, Dept. of Physiology and Programme Director, ACYTER

### *Organizing Secretary:*

**Dr. GK Pal**

Prof. of Physiology

### *Treasurer*

**Dr. GS Gaur**

Adl Prof. of Physiology

### *Co-ordinator*

**Dr. Ananda Balayogi Bhavanani**

Programme Coordinator, ACYTER

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Prof. of Physiology,

**Dr. Pravati Pal**  
Prof. of Physiology,

**Dr. Vivek Kumar Sharma**  
Asst Prof. of Physiology,

**Dr. S Velkumary**  
Asst Prof. of Physiology,

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Mr. E. Jayasettiaseelon,

**Practice Sessions:** Dr. Madanmohan, Mr. G. Dayanidy, Miss. L. Vithiyalakshmi

**Invitation:** Dr. S Velkumary, Dr. Basanta, Dr. M Rajajeyakumar, Dr. Archana Gaur, Dr. P Punita,  
Mr. B Hari Krishna, Mrs. M Tamilarasi, Miss. N Padmapriya, Mr. G. Dayanidy

**Accommodation & Transport:** Dr. GS Gaur, Dr. M Gopinath, Dr. T Dinesh, Mr. E Jayasettiaseelon,  
Mr. V Kanagaraj, Mr. P Munisamy

**Inaugural:** Dr. Pravati Pal, Mrs. Bharati Balakumar, Dr. B Grishma, Mr. NSS Kiran, Mrs. P Sentamije Selvy,  
Dr. Zeena Sanjay

**Cultural Programme:** Dr. Ananda Balayogi Bhavanani, Dr. S Nishanth

**Food, Refreshment & Cleaning:** Dr. Vivek Kumar Sharma, Mr. T Ramkumar, Mr. SK Dhandapani,  
Mr. K Subburaman, Mrs. M Sutha, Mrs. S Suseela, Mr. C Sivakumar

**Valedictory:** Dr. D Thenmozhi, Mr. T Ramkumar, Dr. Zeena Sanjay

**Accounts:** Dr. GS Gaur, Mr. S Mourthy

**Office Work:** Mr. Mathivathanan

## **Workshop cum Seminar on Diabetes Mellitus: Work Distribution**

Dr. Madanmohan : Organizing Chairman, Practice Session  
Dr. GK Pal : Organizing Secretary, Scientific Programme  
Dr. P Vijayalakshmi : Organizing Committee  
Dr. GS Gaur : Treasurer, Accommodation & Transport,  
Dr. Pravati Pal : Inaugural  
Dr. Vivek Kumar Sharma : Refreshment  
Dr. S Velkumary : Invitation  
Mrs. Bharathi Balakumar : Inaugural

Dr. Basanta Manjari Naik : Invitation & Registration  
Dr. M Rajajeyakumar : Invitation & Mementos  
Dr. D Amudharaj : Scientific  
Dr. D Thenmozhi : Valedictory  
Dr. Archana Gaur : Invitation  
Dr. S Nishanth : Scientific, Cultural  
Dr. K Saranya : Scientific  
Dr. P Punita : Invitation (registration and certificate)  
Dr. T Dinesh : Accommodation & Transport  
Dr. M Gopinath : Accommodation & Transport  
Dr. V Lalitha : Scientific  
Dr. B Grishma : Inaugural  
Mr. T Ramkumar : Refreshment, Valedictory  
Mr. B Hari Krishna : Invitation (Banners, Memento)  
Mr. NSS Kiran : Inaugural

Mr. M Mathivathanan : Office work  
Mrs. P Sentamije Selvy : Inaugural  
Mrs. M Tamilarasi : Registration  
Mrs. M Sutha : Refreshment  
Miss. N Padmapriya : Registration & Certificate  
Mr. SK Dhandapani : Refreshment  
Mr. K Subburaman : Refreshment  
Mrs. S Suseela : Refreshment & Cleaning  
Mr. C Sivakumar : Refreshment & Cleaning  
Mr. V Kanagaraj : Accommodation

Mr. Daniel : Inaugural  
Mr. Gopi : Invitation distribution and Banner

### **ACYTER**

Dr. Ananda Balayogi : Coordinator, Cultural Programme  
Mr. E Jayasettiaseelon : Scientific, Accommodation and Transport  
Dr. Zeena Sanjay : Inaugural, Valedictory  
Mr. G Dayanidy : Practice Session, Invitation distribution  
Miss. L Vithiyalakshmi : Practice Session  
Mr. S Mourthy : Accounts  
Mr. P Munisamy : Accommodation and Transport, Banners

## **A YOGIC PERSPECTIVE ON HEALTH AND DISEASE**

Kalaimamani, Yogacharini Smt. MEENAKSHI DEVI BHAVANANI

"Health and happiness are your birthright! Claim them!" thundered the "Lion of modern yoga" Yogamaharishi Dr. Swami Gitananda Giri Guru Maharaj. "You are born to be healthy and happy. But, the goal of life is moksha – freedom!"

We live in "topsy-turvy times", when ancient values have been flipped onto their heads. One rarely meets a truly "healthy" or "happy" person. In fact, for the vast majority of the human race, health and happiness are distant dreams. Illness, depression, conflict, sorrow, stress, tension and frustration are the "birthright" even of young children in modern times. Billions of dollars are expended by the health industry. Medical science can put pig valves into human hearts and transplant vital organs. Super specialty hospitals abound. The pharmaceutical industry produces a huge amount of life-saving drugs. Why, then, is a truly healthy, happy person such a rarity?

Modern man, like the Biblical Essau, has sold his birthright for a "mess of porridge". Like Judas, he has betrayed his Christ consciousness, his cosmic consciousness, for less than "30 pieces of silver".

Swami Gitananda has put before us a simple reason for this sad state of affairs. He advised. "If you want to be healthy, do healthy things. If you want to be happy, do happy things." People cry, "I want to be healthy." Then, they indulge in bad habits like tobacco and alcohol, spend late-hours watching television, do not exercise properly, do not drink enough water. Others moan, "I want to be happy!" but they fight, they gossip, they quarrel, they criticize, they delight in conflict, in violence, in defeating others, and crushing competition under their feet. It is irrational to expect that by doing unhealthy things, one can be healthy. It is irrational to believe that by doing unhappy things, one can be happy. Yes, man is an irrational animal indeed!

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*Ashram Acharya and Director, ICYER and Yoganjali Natyalayam, Pondicherry. [www.icyer.com](http://www.icyer.com) and [www.rishiculture.org](http://www.rishiculture.org)*



Yoga is the ancient science of India which shows man not only how to claim his birthright of health and happiness, but also to obtain the goal of life – moksha. Any scientist worth his salt begins his career by studying the laws of nature and the basic theorems and tenets of his science. The yogic scientist is no exception to this rule. The physicist studies the physical laws of nature - gravity, momentum, etc. The chemist studies the chemical properties of matter. The biologist studies life forms, the doctors, anatomy and physiology of the human body. This is the "field" within which they will work, observing the laws of action and reaction, the laws of cause-effect relationship, within that limited spectrum.

For the yogi, the entire universe and everything in it is his "field of research." He studies the Universal laws which operate within this field. The law of karma, the law of cause-effect, is an important Law for him. The yogi knows that the laws which govern the microcosm also govern the macrocosm, and so, he understands that by studying himself, his "small self," his "own self", his own body, mind and emotions, he can understand the "big self", the Atman, Brahman. This process in yoga is called "swadhyaya" or "self study" and it is the fourth niyama of Patanjali's Ashtanga Yoga. The rishis, cosmic scientists, have taught, "Without moving out of one's own cave, one can comprehend the universe." They realized that universal truths lay within one's very own heart. "Man, know Thyself" is the admonition which was written on the entrance to the Greek temple at Delphi. This is the starting point of all endeavors. This is the starting point in the long journey to claim one's birth right. Alexander Pope, the great 18th century English poet, wrote, "Man, know thy self / presume not god to scan / the proper study of mankind / is man."

Through this "self study" the yogi discovers that human nature is governed by an inexorable law - and the very law which governs his nature - is the very law which governs the universe. This law is called "Sanatana Dharma" or "the eternal law" and is unbreakable. One has no choice but to discover it, and then, live in harmony with that eternal law. Only then will one be entitled to enjoy one's birthright - health and happiness. The Christian Bible teaches, "The wages of sin is death." "Sin" is nothing more than defiance, rebellion and disobedience to the eternal law. Yogamaharishi Dr. Swami Gitananda Giri taught his students: "you cannot break the law. You can only break yourself over the law." How do we know if we are "breaking the law"? The results are there for all to see: sickness, suffering, unhappiness, conflict, stress, and tension.

One might retort: "But I am unhealthy! I am unhappy! I am not breaking law! I am not an outlaw!" Look again! Indeed, such a person must be breaking the law, whether knowingly or unknowingly. Remember, even in human jurisprudence, "Ignorance of the law is no excuse." No court on earth will excuse a law-breaker who pleads "ignorance of the law". All citizens are expected to not only know the law, but also, to abide by it, so that the society may flourish in a harmonious manner. But, who wants to be unhealthy? Who wants to be unhappy? If these are the result of breaking natural law, then why do people do it? The answer is pure and simple: ignorance. The Sanskrit word for "ignorance" is "avidya". Patanjali, the sage who codified the principles of yoga 2500 years ago in 196 magnificently concise sutras, calls "avidya" or "ignorance" as the "Mother klesha". A klesha is a hindrance, an obstacle to spiritual growth. Basically, klesha is the root cause of all human problems. There are pancha klesha or "five hindrances". Sometimes "klesha" is translated as "a knot of the heart". It prevents the human being from further spiritual advancement and drags the human into the mire of misery. The other four kleshas are: asmita (egoism), the sense of separation, the sense of I, raga (attraction due to pleasure), dwesha (aversion due to pain) and abinivesha (clinging to life, the survival instinct). These are the "obstacles" which stand between man and his desire to claim his birthright of health and happiness. But the root of all obstacles is avidya (ignorance), ignorance of the law, and hence, the constant attempt to "break the law".

What is ignorance? Look at the word. It is composed mostly of the word "ignore". "Ignore" implies "a refusal to see". If we "ignore" someone, it implies a deliberate attempt to cut this person out of the field of our awareness. If we attend a gathering and find someone we have aversion towards (dwesha) present, we usually "ignore" that person, literally, turning "our back on them" so that we do not have to "see" or "acknowledge" them.

But, if ignorance of the universal law causes us to break the law, and hence, results in disease and unhappiness, why do we as humans continue on this path to death and destruction? Because we are taught, and we willingly accept this falsehood, that we are not responsible for our own health and happiness. We have given over the responsibility for our own health to the doctor, and have asked him to find us a pill, or cut something out of our body, or stick something into it, and make us healthy again. We have given the responsibility of our happiness to the government, the society, to the media, to the entertainment industry, to anti-

depressant medicines, and asked them to "please us, to give us about we want, to make us happy."

We have sold the most precious quality we possess as humans, "manas" or conscious awareness, and its twin virtues, independence and self-initiative, to the various powerful lobbies which govern our lives. And they in turn, most benevolently "put us to sleep", sedate us, put us under anesthesia, so we no longer feel the pain inherent in breaking the law. We are hypnotized into a fitful sleep from our childhood to our old age, and into the funeral pyre itself. We are lulled into a somnolent state in order to make our life's journey bearable, with a minimum of pain – we are neither healthy nor happy, but blissfully numb and anesthetized.

Why should our entire social, political, educational, business, commercial, media and entertainment structure be geared to keeping us numb and dumb? For a simple reason: there's plenty of money and power in unhappiness and disease. But, there's no money in health and happiness. How would doctors and the huge drug industry support themselves if all were healthy? Would we watch mindless violence and sex and vulgarity in cinemas and television if we were truly happy? Would the manufacturers of weapons of mass destruction flourish financially if all were happy and healthy? It is beneficial to all the world's commercial interests that the five billion people on the planet are kept sick and unhappy, in a state of unfulfilled desire and thus, in constant frustration.

As an example close to home, look at the field of dentistry. When I came to Pondicherry in 1968, there was one dentist in town. I did not know anyone who had problems with their teeth. Cavities were rare. On the contrary, I was struck by the beautiful, white healthy teeth of our Indian people. Even villagers had dazzling smiles! Life was simple. Processed foods were a luxury. Natural food was the norm.

Cut to the present scenario. The number of dentists in Pondicherry numbers more than 500! Children as young as four years of age have cavities and dental problems. I don't have to tell you professionals where the problem lies. It is obvious! The abundance of refined foods, sugars, sweets, soft drinks, ice creams, lack of oral hygiene has destroyed the nation's teeth! The good old neem stick has been discarded as "old fashioned" and we now spend Rs.20 on a toothbrush and Rs.50 on toothpaste which is not one-hundredth as effective as the old neem twig! Is this progress? Is this the obedience to natural law? Is this health? The villager cannot

afford to buy toothbrush and toothpaste – this would cost him one day's wages. This "progress" has not only taken his health, but also his happiness. He will “become unhappy because he does not have the money to buy such items!” Should not the emphasis in social dentistry be on spreading awareness of the horrendous damage caused to the teeth by these modern junk foods and drink? But, emphasis seems to be more focused on cure, rather than prevention. Lip service is given to these ideas but the powerful commercial lobbies are quick to squelch any effective activism on these subjects. This is not only in the field of dentistry. It is the fact in every single aspect of life. There is no money or glory or power in prevention, but plenty of it in cure! Instead of educating people to "obey natural law", the modern trend is to repair people who have "broken themselves over that law."

Avidya, ignorance! It is a disease, which is more deadly than an atomic bomb. It has already burst upon the earth and is enveloping all mankind in its black, poisonous mushroom cloud. It is the root cause of all unhappiness and disease.

"Vidya" – wisdom, knowledge – is the opposite of "avidya" or ignorance. It basically means "to see". The rishis were "Men who saw Reality as It Is." If we wish to claim our birthright of health and happiness, we must "Arise and Awake." We must open our eyes to see and our ears to hear. When this "Awakening" occurs, one will be drawn to the yogic science. It is the start of the long spiritual journey.

The "Core Concept" in accepting yoga as a way of life is embedded in the word "responsibility". One must be prepared to accept "total responsibility" for one's own life, total responsibility for one's thoughts, words and deeds, total responsibility for one's own health and happiness. This is, in essence, obedience to the "eternal law" which states, "all karma – all action – has its reaction and that re-action will always rebound on the one who committed the action." Just as the sudarshan chakra (celestial discus) of Lord Vishnu followed the sage Durvasa wherever he ran as he tried to hide until he made amends to King Ambarish for harming him, so also the "reaction" of our "action" will follow us wherever we go, until we "pay out" the karma in consciousness. In short, if we do unhappy things, we will be unhappy. If we do unhealthy things, we will be unhealthy. There is no "breaking" this law and even the best doctor, the best dentist or the best entertainer cannot keep our karma forever at bay. The sign on the yogi's door (whether the door leads to his palace or the door leads to his cave)

reads. "The buck stops here." That is, the yogi takes total and complete responsibility for himself and everything which happens to him and makes a conscious choice to "live within the law", rather than choosing to be an "outlaw."

The word "responsibility" also has another aspect. Broken into two parts it reads "responsibility", or "the ability to respond". The yogic way of life cultivates and values consciousness and awareness. Hence the yogi develops the "ability to respond" correctly to any given situation. The correct "response" will produce a "positive effect" and the result of such a positive action-choice is overall health, harmony and happiness.

Yoga is the science of consciousness, becoming aware of universal laws and obeying those laws in thought, word and deed. Obedience to the law produces health and happiness. Disobedience produces disease and suffering. As a scientist, the yogi employs all the tools of any great science: he possesses an elaborate terminology which helps him define and understand the problem; he possesses equipment and tools for his search – asanas, pranayama, concentration practices, mantras, cleansing techniques, etc.

He/she enjoys access to a great body of theoretical concepts, accumulated through hundreds of generations of "spiritual experiments" conducted by the great rishis who have preceded him. This "theory" is recorded in the Vedas, the Upanishads, the Bhagavad Gita, the Yoga Sutras, the Gheranda Samhita, the Hatha Yoga Pradipika and other ancient scriptures. His laboratory, his field of research, is his own body, emotions and mind and his relationship and correspondence to the Universe. The yogi is a detached observer who carefully records his data and comes to his own conclusions based on his own direct observation and experiences.

He begins with this primary hypothesis – the universe is cosmos, it is not chaos. "Cosmos" implies "order", and "order" implies "laws". He sets out to discover those laws and to observe the working of those laws in his own life and in the lives of others. The yogi then attempts to "apply" his findings in a practical manner – in his own life, coming to the same "realizations" as those enjoyed by the rishis of old. Health and happiness manifest automatically in such a life, which attunes itself to cosmic law. Health and happiness are automatic byproducts when avidya or ignorance is dispelled and vidya, seeing reality for what it is develops. The yogi follows the "great law of virtue" which is elaborated in the yogic tradition as the pancha yamas or moral restraints and the pancha niyamas, the ethical observances. These maha

vratas, the mighty vows of virtue, reflect the Sanatana Dharma or the eternal law. The yogi develops a love for virtue, a love for the law. He realizes "virtue is its own reward." He attunes his own microcosm to the rhythm of the macrocosm. He moves with Nature, not against it. Nature is his friend, with whom he lives in harmony, and not an enemy to be conquered or exploited.

"Sanatana Dharma" is difficult to translate. It can be called "the eternal law", "the cosmic law", even "the structure of the universe as it is". "Sanatana" means "eternal" – That which was, which is, and which shall always be – unchanging, self-created, unborn, undying. "dharma" takes its root meaning from "dhar" which means "stability, even-ness, balance." The English word "durable" has come from "dhar" – that which endures. "Dharma" is hence that which gives stability. Stability is an essential component of health. As any good doctor knows, the best news he can give anxious relatives is that the patient has "stabilized." Stability is also an essential component of happiness. Nothing creates more misery than an unstable family, unstable romantic relationships, unstable work or social environments. Sanatana Dharma sometimes is more loosely defined as "the law of virtue". Virtue creates stability. Clean, pure, restrained, controlled, conscious aware living is the basis of all virtue. Such qualities create personal, interpersonal and intrapersonal stability. Hence, one becomes aware of the necessity of obeying "the law of virtue", if one wishes to be qualified to claim one's birthright as health and happiness. As Yogamaharishi Dr. Swami Gitananda put it so succinctly: "Following yama–niyama, obeying the cosmic law is "No-Option Yoga" for those who wish to spiritually evolve themselves in health and happiness."

Our ancients linked particular diseases to certain lapses in character. These linkages can be found in many Puranas. Arthritis is linked to greed, refusal to let go, or to share. Digestive problems were linked to hoarding, excessive, selfish accumulation. The old idea that diseases were caused by a moral lapse had much truth. Interestingly enough, modern medicine is also coming to a similar conclusion, though by a different route. Research findings have enabled medical men to draw up "personality profiles" for cancer patients, heart attack patients, diabetics, AIDS patients and so on. Character creates circumstances. Character is composed mostly of the word "act". The manner in which we habitually "act" forms our "character." Our actions determine whether we are healthy or unhealthy, happy or unhappy. This is the

essence of Sanatana Dharma. We create our own destiny by our thoughts, our words and our actions. There is no such thing as an "innocent victim" in the universal Scheme of Things.

The yogi grows in consciousness and spirit till he becomes an "adhikarin" a "fit person" for "realizing reality". He becomes competent to "claim his birthright of health and happiness." But, that is only the beginning of his journey. He has arisen! He has been awakened! And now it is his duty to "stop not till the goal of moksha" is reached. But, though the pilgrimage is long and arduous, the universe herself/himself/itself grants him his birthright – health and happiness as the reward for obeying natural law. He has the health, strength and good cheer to make his cosmic journey and he has the happiness to enjoy his travels in space and consciousness. Buoyed by this spiritual legacy, the yogi now has a raft to cross the ocean of samskara. "Avidya" or ignorance of universal law is banished by "vidya", the light of conscious awareness. His eyes are opened. He sees! Happily and healthily he realizes that he lives not on a small planet, in a small galaxy, tiny as a grain of sand. He is a universal being, a universal citizen obeying the laws of the cosmos. And the Universe is his own, his native land!

## **BURDEN OF DIABETES AND ROLE OF DIET IN ITS PREVENTION AND MANAGEMENT**

Dr MADANMOHAN MD, DSc, FIAY

Non-communicable diseases including diabetes mellitus (DM) impose a huge burden on our health care delivery system and are responsible for more than 60% morbidity and mortality. They represent a “slow motion disaster” as their incidence and death toll is rising steadily. Rapid urbanization, consumption of fast foods, sedentary life and stress are at the root of the problem. India was projected to become the diabetic capital of the world. However, this dubious distinction has been taken by China with 90 million diabetics as compared to India’s 61 million. It is projected that in 20 years, these figures will increase to 130 million and 100 million respectively. If we do not take preventive measures, the numbers will rise and India may wrest the title of the diabetic capital of the world from China. Unless we take appropriate measures, we are likely to surpass China in population, number of elderly, obesity and chronic disorders including DM. While in the west, type 2 DM peaks in 60s, in India, it is ~10y less. Furthermore, the average age is decreasing with large number of people developing the disease in their 30s, the peak of working lives. This has a tremendous economic impact on the individual, family and the nation. “Hidden” diabetes, characterized by dysglycemia and impaired glucose tolerance occurs in about 20% of “healthy” people. Many such persons remain undiagnosed till the disease reaches an advanced stage. Childhood obesity is another cause of worry. As in west, 20% children from affluent Indian families are obese and 8% have higher blood pressure. Junk food topped by colas and chips as well as lack of physical activity due to excessive computer use is the cause of childhood obesity. Gestational diabetes results in obese kids who have higher risk of developing type 2 DM.

Puducherry has a high prevalence of DM. A recent survey on the eve of World Diabetes Day (14 Nov) has reported that 6% of population has the disease. Since the numbers are usually underestimated, the actual prevalence is likely to be about 12%. The figures are 17% for

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Mumbai and 40% for Nauru, a small island in the Pacific. A silent killer, DM is a cruel and deadly disease that goes hand-in-hand with other chronic disorders. Diabetic neuropathy, retinopathy, nephropathy and diabetic foot make the life of patient as well as care givers miserable. Access to quality medical care is a dream, especially for our rural masses.

Prevention is better than cure. Being holistic, yogic lifestyle is ideal for prevention as well as management of DM. The key elements of yogic lifestyle include yogic diet, disciplined yoga practice, management of stress and development of yogic attitude. Education and awareness are of fundamental importance. Early detection and lifestyle modification should be the cornerstone of the strategy. Healthy lifestyle should be adopted early in life since major biological and behavioral risk factors emerge early in life and continue to have a negative impact throughout one's life. Education and healthy meals in schools will go a long way in stemming the tide of DM and other chronic disorders. Junk food, including colas should be banned in schools. Such measures may be costly, but the returns are cost-effective with long-term benefits.

DM results from an interaction between genetic and environmental factors. Genes determine susceptibility to disease and opportunities for health while environmental factors determine which susceptible person will develop the disease. Nutrients and physical activity influence gene expression. Gene-nutrient interactions are modulated by the dynamic influences of environment. Individual genetic variations influence the impact of change in diet. Since we cannot change the genetic code of the population, we have to emphasize environmental factors. A substantial increase in the incidence of DM in recent years clearly suggests important role of environmental rather than genetic factors. It also suggests the potential of stemming the tide by lifestyle modification. Significant increase in the incidence of type 2 DM has occurred in populations in which there have been major changes in the type of diet consumed with the resultant increase in body weight and central obesity. Improving diet and increasing physical activity in all age groups-young, adults as well as elderly, will reduce chronic disease risks including that of DM. Diet and physical activity is a complementary strategy not only for prevention, but also for retardation of progression of the existing chronic disease. Healthy eating is the corner stone of prevention and management plan of DM. Hence, patient should stick to diet schedule, including meal time and quantity.

Proper food is the most important factor in the promotion of health. Yogic diet is essentially satvik diet. Yogeshwar Krishn describes satvik diet as one “that promotes longevity, intelligence, vigor, health, happiness, cheerfulness and which is tasty, plain, substantial and naturally agreeable (Bhagavadgita 17:8). From this it is clear that satvik diet must be nutritionally balanced, fresh and pleasant to senses. Satvik food should be offered to the Divine, shared with others and then taken as “prasad” in moderation as yogeshwar krishn emphasizes the importance of proper diet (yuktahar, Bhagavadgita 6:17). Over eating and untimely meals should be avoided. Satvik diet improves physical and mental health and quality of life. It may help in reducing the drug dose and postponing complications of chronic diseases. Some people misunderstand the meaning of satvik diet as one devoid of animal flesh and onions-garlic and then take unhealthy, tamasik junk items made from white flour, saturated fats, sugar and salt. In India, liberal intake of sweets, especially on festivals and other celebrations, the ubiquitous samosa and all pervasive chips are examples of junk food that contribute to obesity and dyslipidemia. Such energy-dense and low nutrient diet is at the root of chronic diseases including DM. Dietary recommendation should be tailored to local/national diets. 20-30 biologically distinct types of foods with emphasis on plant based fresh items should be consumed in a week. Quantity of polished rice should be reduced and whole grains and pulses included in the daily diet. Traditional Indian diet consisting of rice/chapati, dal, curds and salad is an example of healthy diet. Taking of junk food clusters together with low intake of healthy diet like fruits and vegetables. Taking a variety of fresh fruits and vegetables and other plant-based items like whole grains and dals plays a key role in supplying the nutrients and reducing the risk for chronic diseases including DM. The consumption of fruits and vegetables is very low in India, especially in low income groups. India’s average consumption of 120 gm/capita/day is much below the recommended intake of 400 gm/capita/day. Mindless urbanization has resulted in more people getting away from primary source of food production resulting in negative impact on availability of nutritious and fresh food.

Normal adult needs ~30g fiber/day. Plant based satvik food based on whole grains and pulses and adequate in vegetables and fruits supply enough fiber. The role of fiber in preventing chronic diseases like DM, heart disease, colon cancer, hemorrhoids, diverticulitis and constipation has been well recognized. Insoluble fiber speeds food through colon and

improves bowel health. Soluble fiber stabilizes blood sugar and lowers cholesterol. One should eat a variety of fiber rich food items e.g. whole grains, millets, corn, oats, barley, fruits and vegetables. To avoid bloating, take sufficient water and increase the quantity of fiber gradually.

There are reports suggesting that moderate intake of alcohol (2-4 units/day) decreases the incidence of deaths due to DM, CAD, other chronic disorders and text books also endorse this opinion. However, alcohol cannot be recommended even in moderation because of its health risks. Weight loss is a key factor in improving several markers of quality of life. Alcohol consumption adds to the calories consumed. People cannot control their appetite for alcohol and alcohol related deaths are also common. Advice/strategies should be culture and gender sensitive and many Eastern cultures and women do not permit alcohol consumption. Keeping these points in view, we cannot encourage people to “drink in moderation”. We have safe and healthy ways of lifestyle modification-healthy diet, exercise and management of stress.

## **HEALTH BENEFITS OF PHYSICAL ACTIVITY AND YOGA**

Dr ASHOK KUMAR DAS, MD

Healthy lifestyle is the foundation of good health, freedom from disease and improved quality of life (QoL). Physical activity is an important component of healthy lifestyle. Regular physical activity promotes health and fitness. Compared to those who are inactive, physically active individuals have higher levels of cardio-respiratory fitness and stronger muscles. When moderate intensity aerobic exercise is performed for 150 minutes per week (i.e. 30 min / day, 5 days a week), benefits include lower risk of premature death, coronary heart disease, hypertension, type 2 diabetes mellitus and depression. Health benefits continue to increase proportionately and when the above activity is done up to 300 minutes per week, additional benefits include lower risk of colon and breast cancer and prevention of unhealthy weight gain. The benefits of physical activity include:

1. Reduced risk of cardiovascular disease.
2. Reduced risk of type 2 diabetes mellitus, metabolic syndrome, cancers including colon, breast and endometrial carcinomas.
3. Strong bones and muscles.
4. Improved mental health and mood.
5. Improved ability to do daily activities.
6. Prevention of falls and injuries.

### **Physical activity in children:**

According to physical activity guidelines, children and adolescents should exercise for at least one hour per day (mostly aerobic) out of which at least 30 min per day, 3 times a week should be muscle strengthening, stretching and bone strengthening exercises. However, only two 30-40 minute periods per week are scheduled in most of the Indian schools. Also, there is no structuring of exercises to include the above mentioned objectives of the physical activity. Childhood obesity is already an epidemic. Hence, physical activity / exercise programme in school curriculum needs due emphasis.

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**Physical activity in adults:**

For health benefits, adults should do at least 150 min a week of moderate intensity or 75 min a week of vigorous intensity aerobic physical activity or an equivalent combination of moderate and vigorous intensity aerobic activity. Aerobic activity should be performed in episodes of at least 10 min. Adults should also do muscle-strengthening activities that are moderate or high intensity and involve all major muscle groups on 2 or more days a week.

**Physical activity in older adults:**

Apart from the guidelines for adults, balance training exercises should be included for older subjects as they are susceptible to falls. If older adults find it difficult to do 150 minutes of moderate intensity exercise per week because of chronic conditions, they should try to be physically and mentally active as much as possible. They should not attempt to do any activity which involves sudden jerky movements and intense effort.

Acrobic exercises that involve large muscle groups like walking, running and swimming also have health – promoting and therapeutic effect. The intensity of the exercise should be enough to produce 50-80% of maximum heart rate of the individual. Maximum heart rate is calculated from the formula:

$$HR_{\max} = 220 - (\text{age} \times 0.5 - 0.8)$$

Exercise session should be for at least 30 min and on 4 or more days a week. Instead of 30 min on one day, one can have 3 sessions of 10 min each. Young men can do moderate or vigorous exercise, 60 min a day for at least 3 days a week.

**Advantages of yoga:**

As compared to other physical activities, yoga can be more beneficial for older adults. Yoga asanas should be performed within 80% capacity of comfortable zone. In modern life, older population is suffering from stress due to changing socio-economic factors, nuclear families and longer but less healthy life. And yoga is the best means to prevent as well as manage stress.

Yoga as well as other forms of physical activity including moderate intensity aerobic exercises are beneficial. However, yoga has many advantages. During physical exercises,

there is no breath-body co-ordination and they usually are high impact exercises thereby increasing the risk of injury to joints, tendons and ligaments. Yogic exercises are low impact, slow, rhythmic and sustained stretches which include alternate flexion and extension movements of the joints involved. It needs to be emphasized that the holistic science of yoga is the best lifestyle ever designed. Yoga is holistic as it has promotive, preventive as well as curative potential. It is holistic because it improves our physical, mental as well as spiritual health. Yoga is an ideal means to improve physiological functions and promote health and fitness. The overall health benefits of yoga include healthy muscles and bones, flexible joints, healthy weight with improved body mass index, improved concentration and memory and reduced anxiety and depression with resultant improved quality of sleep. The improved overall health is associated with a sense of wellbeing, better energy level and QoL. Yoga has many advantages. It is an effective and inexpensive means to achieve holistic health. It is target-oriented and easy to learn, teach and propagate. Yoga is an all-weather discipline that has positive side benefits in contrast to negative side effects of drugs. Every one can and should practice yoga whether child, youth, elderly, literate, illiterate, healthy or sick.

Apart from health-promoting effects, yoga has a wide ranging therapeutic benefits. It reduces the risk of developing obesity, osteoporosis, high blood pressure and type 2 diabetes mellitus. Yoga can reduce blood pressure in hypertensive patients, blood glucose in diabetics and cholesterol in patients with coronary heart disease. In early stages of the disease, disciplined practice of yoga along with yogic diet can result in complete cure. In more advanced stages, the need for medication may be reduced, thereby reducing the economic burden and negative side effects of drugs. Yoga is beneficial in type 2 diabetes mellitus as it improves insulin sensitivity and decreases body fat and stress levels. Yoga reduces the risk of dying from heart disease and stroke. Regular yoga practice along with standard medical treatment should be encouraged to improve the overall health and QoL of the patient.

Yogic postures (asans), breathing techniques (pranayams) and relaxation (shavasan) have great therapeutic potential especially when practiced in combination and with concentration and awareness. According to Maharishi Patanjali, asan should be steady, firm and comfortable (Sthir-sukham-asanam. Yoga Darshan, 2:46). Going into the posture and coming out of the posture should be done with slow, uniform and graceful movement while maintaining the posture should be steady and without movement. Movement should be with awareness and

accompanied by correct breathing. By acquiring mastery of asan, the effort becomes relaxed (“effortless effort”) and one can meditate on the “Endless” (Prayatna-shaithilya-anant-samapattibhyam. Yoga Darshan, 2:47). One can also concentrate on any organ that needs healing and direct one’s mental energy / pran shakti to that organ or part of the body. This will improve the function of that organ and promote rejuvenation and healing.

Adham pranayam is diaphragmatic or abdominal breathing that is easy to perform and effective in management of stress and type 2 diabetes mellitus. It is done in a comfortable, straight back sitting position (sukh asan) or while lying on the back. While inhaling slowly, uniformly and deeply through nose, one feels expansion of abdomen and while exhaling through mouth, one feels abdomen falling back to the original position. Movement of chest wall should be as minimum as possible. The movements of abdomen and chest wall can be felt with two hands kept on abdomen and chest wall. Breathing should be deep, slow and uniform and with concentrated awareness. Yoga is quite safe. However, a patient should always consult his/her physician before starting the yoga practice. One should be extra careful if there are pathological changes like retinopathy and nephropathy or if blood sugar is very high (>250 mg/100 ml) or very low (<80 mg/100 ml).

## **NATURE AND NURTURE IN DIABETES: A GENETICIST'S PERSPECTIVE ABOUT THE YOGIC APPROACH**

Dr C R SRIKUMARI SRISAILAPATHY PhD

It is a paradoxical fact that our human society is facing two nutritional problems. 600 million people face severe energy deficits and starvation while at the same time 310 million people face a problem of chronic energy surplus and obesity. Linked to obesity, the most worrying trend is that diabetes is being diagnosed in younger and younger Indians. Central body obesity is particularly important because of its association with diabetes, dyslipidemia, hypertension and cardiovascular disease. ‘*Asian Indian phenotype*’ (that has greater susceptibility to diabetes), refers to increased visceral fat and central body obesity, despite low rates of obesity as defined by body mass index. Within the term “diabetes” geneticists are discovering dozens of conditions/genotypes. The delineations are becoming fuzzy, owing to the fact that the candidate genes support a shared etiology between type 1 and type 2 diabetes.

With the advance of genomics the list of candidate genes is ever growing. No wonder consistent with the complex web of physiologic defects in diabetes, the genetics of the disorder involves a large number of susceptibility genes – each with a relatively small effect. The good news is, the analysis of the genetic factors is further complicated by the fact that numerous environmental factors interact with genes to produce the disorder.

Geneticists now understand that one plus one is not equivalent to two and a new field of genetics called *epigenetics* has emerged with the understanding of other dimensions. It is indeed a combination of genes and certain genetic patterns. Being exposed to different lifestyles, one ends up with different outcomes. As said by a nutrigenomics expert Dr. Vincent Bellonzi, “Time after time, we see people who don’t care for themselves and create disease. We see people that take care of themselves and create health. Ultimately our genes are our data cards; one can play that, in any way one wants. Why is it that people with the

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same genetics look different, feel different and have different outcomes? Because of the way the genes are treated”!

One has to start learning how to treat the genes. In other words it is about taking responsibility for ourselves and the lifestyle we adopt. So, when we talk about genomics we actually talk about treating a certain collection of genes in a certain way to get a certain outcome. And if we learn more about genomics we have more and more control over the outcome. This literally brings us to the fact that our activities, our eating habits and the yogic lifestyle we adopt, produce a change in the gene expression. Though we cannot change our genes, we have a lot of control over genetic expression in terms of our lifestyle.

It is here that the role of asanas (yogic postures) is to be understood. It adjusts the function of organs involved, by regulating nervous impulses and blood flow to the glandular areas and by gently massaging and improving the circulation in all the glands and organs. Pranayama controls the body energy, allowing vital forces to flow to those areas that require extra energy. And then come the mudras, bandhas apart from suryanamaskaras and relaxation techniques like yoganidra (a rediscovery by Swami Satyananda from tantra) with scientific documentation of its efficacy by recording biofeedback like EEG patterns and other electrophysiological changes.

Above all the yogic attitude to life can influence the very important section of the brain called hypothalamus that exercises control over major internal organs. It is considered to be part of the major functional link between mind and body. Yoga essentially increases the awareness of the needs and capacity, promoting digestion and metabolism and offering the rewards on health, vitality and higher consciousness. In the process, brain, pancreas and other organs get revitalized consciously and systematically. Yoga is an experiential science which cannot be understood intellectually and will become only living knowledge through practice and experience. Brain function itself is determined through complex and plastic gene expression pattern. Genes - brain – behavior/lifestyle paradigm is the fundamental concept that describes an individual’s response to the environment including social environment. Not to forget that increased stress vulnerability and other forms of pathological and inappropriate stress coping behaviors are also common brain disorders. These events can trigger errors in the metabolic pathways.

Diabetes is complex and its intricate mechanisms can be subtly manipulated by yogic practices. Physical and mental cleansing and strengthening is one of yoga's most important achievements. What makes it so powerful and effective is the fact that it works in the holistic principle of harmony and unification. According to medical scientists yoga therapy is successful because of the balance created in the nervous system and endocrine system which influence all other systems and organs of the body. Instead of treating the disease, it eliminates the causative factors which is the effect of yoga as functional medicine.

The exciting part about the new science of genomics or especially nutrigenomics as stated by Dr. Vincent Bellonzi "that you can change who you are, by how you treat your genes in terms of changing the nutrients that we expose our genes to. Since it is not hard wired, it is truly up to us to make the choice between choosing to take care by ourselves, as opposed to be someone taking care of us and thus prevent the disease called diabetes, essentially created by wrong lifestyle".

## **HOW OBESITY LEADS TO TYPE 2 DIABETES: A PHYSIOLOGICAL EXPLANATION**

Dr V. SRINIVASAN MD

Genes and obesity are the two well-known factors which lead to type 2 diabetes. Of these, genetic factor is very well understood by the fact that children born to diabetic parents have a very low reserve of insulin secreting *beta* cells. So, they are likely to exhaust this reserve by middle age if they have sedentary life and develop type 2 diabetes.

Regarding the contribution of obesity for the development of type 2 diabetes, no convincing explanation is available so far. So, in my present talk, I will give a physiological explanation for the same. It is well known that in obese persons there is down regulation of insulin receptors. So, the secreted insulin circulates as unused insulin resulting in hyperinsulinemia. When a continuous 24 hour insulin secretion was recorded both in normal and obese persons, it was observed that as compared to normal persons the obese persons secreted twice the amount of insulin.

While discussing the natural history of Type 2 diabetes, Text Book of Medicine by Price mentions that hyperinsulinemia precedes the onset of Type 2 diabetes. This stage is also called insulin resistance, because, in spite of hyperinsulinemia there is euglycemia. Further, Chin-Jen et al have observed that altered cardiac autonomic function precedes insulin resistance in metabolic syndrome. They explain this observation by stating that predominant sympathetic activation leads to lipolysis which in turn increases free fatty acids.

This increase in free fatty acids blocks the action of insulin leading to hyperinsulinemia. From the above, it can now be concluded that hyperinsulinemia will lead to exhaustion of insulin secretion resulting in type 2 diabetes. This hyperinsulinemia can be either due to down regulation of insulin receptors as observed in obesity or increased sympathetic activity as observed in altered cardiac autonomic function.

Therefore, yoga therapy is recommended in pre-diabetic persons to counter both obesity and increased sympathetic activity.

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## **A REVIEW OF RESEARCH STUDIES ON YOGA AND DIABETES**

Dr B K SAHAY MD

Antiquity of traditional medicine dates back to over 4000 years, as evidenced in Ayurveda (the science of life). The aim of traditional medicine according to Charak is to maintain the health of healthy person and relieve the suffering of the sick- “*Swasthasya swasthya rakshanam aturasya vyadhi parimokshanam*”.

The ancient Indian physicians had a sound knowledge of diabetes. They described the clinical features and complications of diabetes vividly. Both Sushrut and Charaka emphasized the importance of diet and exercise in the management of diabetes. They categorized diabetes into 2 groups – the obese and the lean and prescribed strenuous exercises for the obese diabetics.

The science of yoga is an ancient one. It is a rich heritage of our culture. Several ancient books make a mention of the usefulness of yoga in the treatment of certain diseases and preservation of health in normal individuals. It has now become the subject of modern scientific evaluation. Apart from its spiritual philosophy, yoga has been utilized as a therapeutic tool to achieve positive health and cure diseases. This concept is promoted in hathayoga and ghatasthayoga by the yoga preceptors. Interest has been evinced in this direction by many workers and studies on the effect of yoga on hypertension, diabetes, asthma, obesity and other common ailments have been carried out.

Does yoga cure diabetes? This question is posed by many. The claim of yogic exponents that yoga cures diabetes is perhaps an expression of the good control of diabetes achieved among obese type 2 diabetics who also respond to diet and exercise. We carried out extensive well designed studies to assess the effect of yoga in the treatment of diabetes as well as other diseases. These studies were performed during the period 1978-1995 at the Vemana Yoga Research Institute, Secundrabad and were published in different journals and presented in various conferences. Today’s presentation is a review of the work done to assess the effect of yogic practices in diabetics.

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***Eminent diabetologist and past president API. Former Professor of Medicine Osmania Medical College and Chief Investigator Diabetes and Yoga Project, Vemana Yoga Research Institute, Hyderabad.***

Several other workers had done studies to assess the effect of yogic practices in diabetics. All these studies highlighted the useful role of yogic practices in type 2 diabetics. However, these studies were done in small number of patients over short periods and looked only at the glycaemic levels.

We designed our studies to answer two main questions:

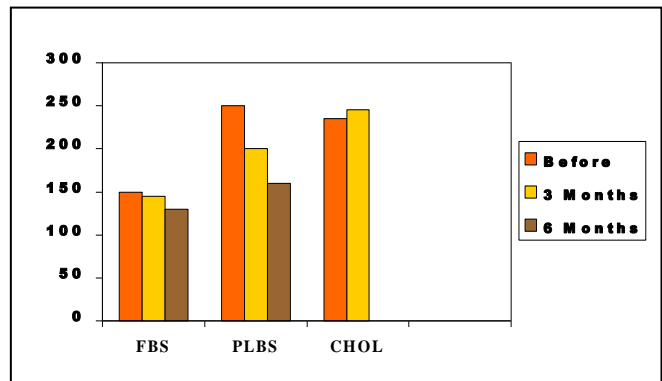
- 1) Does yoga play a role in the control of diabetes?
- 2) If so, what is the mechanism of action and its impact on the development of complications?

With this in mind studies in normal healthy volunteers were carried out to assess the effect of yogic practices on the biochemical and hormonal parameters, exercise tolerance and performance of athletes. Studies were also carried out in the obese and diabetics with hypertension. In diabetics the effect of individual yogic practices was assessed and useful asanas were identified. These studies were both short term and long term follow up studies.

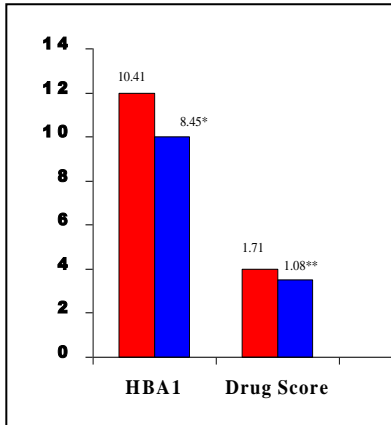
IN NORMAL VOUNTEERS	IN DIABETICS
Biochemical and hormonal changes	Pranayama
Effect on exercise tolerance	Yoga asanas (four groups)
Effect on performance of athletes	Individual asanas
Effect on obesity and hypertension	Acute experiments
Effect on lean body mass and body fat%	Exercise tolerance
	Long term follow up of cases
	Studies in lean type 2 diabetics
	Studies in elderly diabetics

Our earliest study assessed the effect of pranayama on the blood sugar level in 50 normal individuals, which showed a significant fall in the blood sugar levels soon after the practice of pranayama.

In normal healthy volunteers the skinfold



thickness was significantly reduced with increase in the lean body mass, without any significant change in the weight of the individuals. These results prompted us to study the effect of pranayama and other yogic practices on diabetics.



26 NIDDM and 4 IDDM patients were studied for one month. They practiced 4 types of pranayama for 30 minutes followed by shavasana for 15 minutes. They developed a sense of well being within 7 to 10 days and showed a significant fall in fasting and post-prandial blood glucose values. In 17 patients the requirement of drugs came down significantly. Insulin assays were done in 5 of these 26 NIDDM patients. There was normalization of the I/G ratios.

### GROUPS OF ASANAS:

Some asanas have been identified as useful for patients with diabetics in earlier studies. Out of these we chose 8 asanas which could be performed by subjects of all age groups for assessing their effectiveness. In order to assess the effect of individual asanas, patients were randomly allotted to different groups and they performed yogic practices of that group for 45 minutes each day followed by relaxation practices i.e. shavasana and makarasana. The adjacent table gives us different groups of asanas and their effect on blood sugar both fasting and post-prandial. These studies revealed that optimum control of diabetes was achieved by practising dhanurasana and ardhmatsyendrasana while halasana and vajrasana as well as bhujangasana and naukasana were also effective. Yogamudra and shalabasana worsened the diabetic status.

#### Optimum benefit

⌘ Dhanurasana and Ardha Matsyendra Asana (d) Halasana and Vajrasana (b)

#### Slightly effective

⌘ Naukasana and Bhujangasana (a)

Control worsened with

⌘ Yoga Mudra and Shalabasana

When studied individually, dhanurasana was most effective. Why some of these asanas had a deleterious effect is not clear. In all our subsequent studies, we have incorporated dhanurasana, ardhmatsyendrasana, bhujangasana, naukasana, halasana, vajrasana and paschimottanasana along with pranayama.

108 patients with type 2 diabetes were studied for a period of 6 months. All developed a sense of wellbeing and showed significant fall of fasting and post-prandial blood sugar values with better control and significant fall in glycosylated hemoglobin and drug requirements. There was significant decrease in body fat and increase in lean body mass.

MEAN BSL mg%	INITIAL	30 DAYS	60 DAYS	90 DAYS
FASTING	146.10	113.34*	109.29*	101.29**
1SD ±	38.61	34.23	28.65	28.85
POST PRANDIAL	240.30	173.00*	154.00*	150.20*
1SD ±	58.94	55.07	30.07	27.56
DRUG SCORE	1.80			0.85
	1.60			0.71

Studies in patients with secondary OHA failure: Patients who were in poor control with maximum dose of sulphonylureas or combination therapy were subdivided into 2 groups according to the duration of below and above 6 years. Patients in both groups showed improvement in their glycaemic control with reduction in the dosage requirement.

In a study on elderly diabetics, 20 subjects aged more than 60 years with a mean age of 66 years were followed for 3 years. They achieved good glycaemic control maintained over the period of 3 years. No long term complications of diabetics were encountered.

Parameters (X ± 1sd)	Initial	1 yr	2 yr	3 yr
FBS (mg/dl)	137.16±29.80	91.42±18.98	82.53±15.08	85.30±15.98
PPBS (mg/dl)	199.79±33.86	139.04±27.55	139.04±27.55	142.00±28.00
Drug score	1.47±0.84	0.55±0.91	0.50±0.91	0.34±0.47

**STUDIES ON LEAN DIABETICS:**

A subset of lean diabetics with BMI less than 18 were studied. There was improvement in glycaemic control with reduction in body fat content and improvement in lean body mass. There was reduction in cholesterol,

	Before Yoga	After Yoga
Cholesterol (mg/dL)	208.70 ± 38.27	194.67 ± 20.00
Triglycerida (mg/dL)	130.50 ± 22.22	105.33 ± 17.74
HDL (mg/dL)	44.30 ± 6.25	47.83 ± 5.42
LDL (mg/dL)	136.30 ± 42.03	121.17 ± 29.06
VLDL (mg/dL)	26.73 ± 4.74	22.50 ± 6.83
FFA (mu/L)	482.20 ± 82.02	420.20 ± 64.63

triglyceride, LDL and free fatty acid levels and an increase in the HDL levels.

**Long term follow-up studies:** 32 NIDDM and 3 IDDM patients who attended the institute regularly were studied for a period ranging from 2 to 7 years. All of them showed a significant fall in the fasting and post-prandial blood glucose values within 3 months and continued to have a smooth and good control of diabetes during the period of the study as evidenced by a normal glycosylated hemoglobin and blood glucose levels.

The drug requirements were significantly reduced. There was a significant increase in the max treadmill time from 8 min to 12 min.

	<b>Before Yoga</b>	<b>After Yoga</b>
BMI Mean $\pm$ 1SD	18.96 $\pm$ 0.96	18.70 $\pm$ 1.34*
FBS Mean $\pm$ 1SD	56.10 $\pm$ 62.02	95.94 $\pm$ 31.39 **
PLBS Mean $\pm$ 1SD	259.20 $\pm$ 82.51	151.60 $\pm$ 44.69 **
GlyHb Mean $\pm$ 1SD	10.56 $\pm$ 3.82	9.07 $\pm$ 3.34

These patients were free from episodes of diabetic ketoacidosis, hypoglycemia and did not develop any vascular complications. Infection rate was also negligible.

All these studies show that in different subsets of patients - obese, lean and elderly with different durations of diabetes, there was improvement in glycaemic control which persisted over long periods of time with protection from long term complications.

**EFFECT ON COMORBID CONDITIONS**

Hypertension is commonly encountered in patients with diabetes and has a significant role in the development of both microvascular and macrovascular complications. Along with hypertension dyslipidemia is also equally common. Hence in our studies we assessed the impact of yogic practices on these co-morbidities.

**a) Hypertension:** Patients with hypertension were advised pranayama and shavasana. 20 non diabetic patients with moderately elevated BP had reduction in both systolic and diastolic blood pressure after 3 weeks of yogic practices and the blood pressure was maintained at normal levels with significant reduction in the dosage requirement of anti-hypertensive drugs. Similar reduction in the

BP (mmHg)	Initial	30 days	60 days	90 days
<b>Systolic</b>				
X	144.00	136.00	135.00	130.70
$\pm$ 1SD	18.14	7.50	11.10	10.10
P		<0.05*	<0.05*	<0.05*
<b>Diastolic</b>				
X	95.70	90.00	88.50	86.90
$\pm$ 1SD	6.44	3.77	4.90	5.03
P		<0.05*	<0.05*	<0.05*



systolic and diastolic blood pressure and the fasting and post-lunch blood sugar was observed in patients with diabetes and hypertension. The blood pressure came under control in 15 days and the effect was sustained even in studies upto 3 months. Patients were free from cerebro-vascular, cardiovascular and renal problems.

	<b>BEFORE</b>	<b>AFTER</b>
CHOLESTEROL	189.70 ± 30.27	188.80 ± 25.42
TRIGLYCERIDES	129.45 ± 44.00	106.10 ± 39.73*
HDL	44.44 ± 4.95	46.55 ± 5.05 **
LDL	118.68 ± 35.45	117.90 ± 31.78
VLDL	25.87 ± 8.98	21.22 ± 7.83*
FFA	416.3 ± 83.97	399.0 ± 89.89

**b) Dyslipidemia:** The impact on lipids was studied in the different groups of patients. The effect of yoga asanas on lipoprotein profiles was studied. There was a significant decrease in the free fatty acids, LDL and VLDL cholesterol and increase in HDL cholesterol. These changes suggest improvement in the insulin sensitivity following yogic practices.

**EXERCISE TOLERANCE:** Comparative studies of the effect of yoga and physical exercise on the exercise tolerance in normal healthy volunteers as well as athletes showed improved exercise tolerance and postponement of the anaerobic threshold with both, but with yogic practices this occurred with a significant reduction in the minute ventilation and oxygen consumption. Our diabetic patients also showed improvement in exercise tolerance after 2 months of yogic practices with an ability to carry out exercise for longer periods.

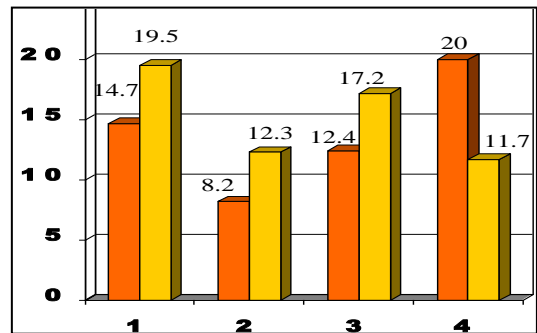
**PLASMA INSULIN:** Our studies revealed a reduction in the fasting insulin levels and a shift of the peak level of insulin to the left. There was a normalization of I/G ratio with a reduction in free fatty acid levels, suggesting better peripheral utilization of insulin and reduction in insulin resistance. In a study on 5 patients with uncontrolled diabetes, the effect of yogic practices on the insulin receptors was studied. At the end of 4 weeks, there was a

significant rise in the insulin receptors although the blood sugar values did not yet normalize, indicating a reduction in insulin resistance and improved insulin sensitivity.

**EFFECT OF PRANAYAMA ON LUNG FUNCTIONS IN DIABETICS:** Lung functions (FEVI, FVC, PEF, FEVI/FVC and FEVI/Transfer factor) in 20 diabetics both IDDM and NIDDM were carried out before and after 3 months of practice of pranayama and were compared with 5 diabetic subjects who did physical exercise instead of yoga for 3 months. The analysis of the data showed that the lung functions improved significantly while blood sugar and glycated hemoglobin reduced significantly in the study group as compared to the control group of diabetics of comparable age and severity who did other physical exercise instead of yoga.

**EFFECT OF YOGA PRACTICES ON CMI IN TYPE 2 DIABETES**

These were carried out in 4 patients; the practice of yoga improved the cell mediated immunity as evidenced by lymphocyte transformation test given in adjacent figure.



**ROLE OF YOGIC PRACTICES IN PREVENTION OF TYPE 2 DIABETES**

Overall, yogic practices increase lean body mass and decrease body fat percent and thereby improve insulin sensitivity and reduce insulin resistance which is the major abnormality in type 2 diabetes preceding the development of overt diabetes by several years. Therefore we postulate that these beneficial effects on the insulin kinetics prevents beta cell exhaustion thereby preventing the development of type 2 diabetes.

**FOLLOW UP OF CHILDREN OF DIABETICS**

5 YEARS	ON YOGA	WITHOUT YOGA
NO. DEVELOPED DIABETES	1/24	10/56

## **ROLE OF YOGIC PRACTICES IN TYPE 1 DIABETES:**

Similar studies were done in type 1 diabetics. Their number was small. However, the following observations could be made:

1. They showed improvement and better control of their diabetes with reduction in insulin requirement.
2. Three of these patients who had brittle diabetes with wild fluctuations in their glycaemic status showed significant improvement following yoga and got stabilized, thus blunting their brittleness.

## **SUMMARY AND CONCLUSIONS:**

These studies have so far confirmed the useful role of yoga in the control of diabetes mellitus. Fasting and postprandial blood sugar levels came down significantly. Patients developed a sense of well being within 10 days with lowering of dosage of drugs and diminished incidence of acute complications like infection and ketosis. There were significant changes in the insulin kinetics and those of counter-regulatory hormones like cortisol. There was a fall in free fatty acids suggesting a better insulin sensitivity and decrease in insulin resistant. There is a beneficial effect on the co-morbid conditions.

We have identified the following asanas to be useful in controlling diabetes: dhanurasana, ardhamatseyendra asana, halasana, bhujangasana, naukasana, vajraasana and paschimottanasana. These can be practiced along with pranayam.

We conclude that yogic practices are useful in all age groups and can be performed in all seasons.

Following yogic practices

- ⌘ The body fat % comes down
- ⌘ Lean body mass increases
- ⌘ Upregulation of insulin receptors



- ⌘ Improved insulin sensitivity and decreased insulin resistance

## **BENEFICIAL EFFECTS OF A YOGA BASED LIFE STYLE IN IMPROVEMENT OF RISK FACTORS FOR CORONARY ARTERY DISEASE**

Dr. SHANTHARAM SHETTY MD

Increasing understanding of various risk factors as causative agents of coronary artery disease (CAD) has generated a lot of interest in prevention and regression of arterial disease. Many researchers have proved that proper lifestyle has great potential in prevention & treatment of cardiovascular diseases. Evaluation of improvement in risk factors like faulty diet, lipid profile, body mass index (BMI), waist to hip ratio (WHR), stress, diabetes mellitus (DM) and blood pressure (BP) in the ischemic heart disease patients was done in a study namely “CARING HEART PROJECT”. This prospective controlled, open trial included angiographically proven coronary artery disease patients (71 patients in study group and 42 patients in control group). All these patients had multiple risk factors for CAD. They were followed for the period of one year. Patients were assessed at base line and at the end of one year after following yogic lifestyle and yogic sattvik diet. The primary efficacy variables were percent change from baseline at one year in total calories in diet, fat content in diet, complex carbohydrate content in diet, BMI, WHR, lipid profile, stress levels, blood glucose and blood pressure.

### **STUDIES ON RISK FACTORS FOR CAD**

Syndrome X, faulty diet, wrong habits, sedentary and stressful lifestyle are some of the etiological factors responsible for CAD. Risk factor modification is the latest strategy being implemented for preventing CAD. Yoga based lifestyle modifications along with yoga diet have earlier shown to have been beneficial in CAD in small number of patients. Ornish et al (2000-2003) have conducted extensive studies on the effect of lifestyle changes based on yoga philosophy and yogic diet on reversal of CAD. Lifestyle Heart Trial (LHT) and Multimember Lifestyle Demonstration Project (MLDP) were 2 classic clinical trials developed to assess improvement in medical risk factors and quality of life in subjects with

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coronary artery disease, after risk factors modifications. The MLDP was carried out to assess generalizability of lifestyle change program to different geographic regions of United States and women with heart disease. These trials included comprehensive lifestyle changes (diet, exercise, stress management and social support) for patients of CAD and the effects of these changes on cardiovascular risk factors & events were assessed.

Manchanda et al, 2000 studied the effect of a yoga lifestyle and yoga diet on coronary artery disease. The study consisted of 42 men with CAD who were randomly assigned to a yoga intervention group or a control group and were followed for one year. The yoga lifestyle program included a strict control of risk factors, weight reduction, increased physical activity, dietary modifications and stress management. This resulted in favorable changes in lipid profile and in CAD in subject group in comparison to control group.

### **THE YOGA INSTITUTE STUDY – CARING HEART PROJECT**

The Yoga Institute, Santacruz, Mumbai, India has been working on similar lines for a number of years. Many cardiac patients have benefited from this 90 year old institute. Seeing the beneficial effect of yoga based lifestyle and yogic diet, the study called CARING HEART PROJECT was initiated as mentioned earlier. A yoga based lifestyle primarily deals with balanced state of mind and healthy body. This is achieved with the help of yoga philosophy, yoga techniques and yogic sattvik diet. The philosophy of better living through yoga is based on principles from Patanjali's yoga sutra and Sankhya philosophy. The yogic sattvik diet could be described as a lacto-vegan diet that is high fiber, low fat, moderate protein and high complex carbohydrate diet including 10% of the total calories as fats with restriction of all non-vegetarian, processed foods and alcohol. This was associated with yoga techniques like yoga asana and meditation which helped in better compliance of the diet. Asanas used were sukhasana, vakrasana, yastikasana, savasana and pranayama. The diet was based on nutritionally balanced diet as prescribed by the National Institute of Nutrition, Hyderabad. The dietary changes were modifications of the patient's existing diet, thus ensuring good patient compliance. The control group was managed by conventional methods i.e. risk factor control and American Heart Association Step 1 diet.

## **MATERIAL AND METHODS:**

**The Study Group** - This prospective controlled, open trial included angiographically proven coronary artery disease patients (71 patients in study group and 42 patients in control group), with multiple risk factors. Both the groups were comparable to start with in terms of age and anthropometric parameters. The study was approved by the Ethics Committee of the Yoga Institute. Written informed consent was obtained from all the participants prior to initiating the study. After initial screening, ECG, X-ray and biochemical tests were performed. All were asked to continue drugs as per their physician's advice except statins. No other concurrent therapy for control of any of the risk factors was permitted.

**Baseline Assessment** - All the participants were subjected to baseline assessment like myocardial perfusion imaging (MPI) test, angiography, biochemical tests, anthropometric measurements, psychological assessment and clinical evaluation. The study group was closely monitored and trained at the Yoga Institute and control group was followed as per conventional norms of treatment at an outside venue.

**Guidelines to participants** - All the participants from the study group were told to undergo yoga training in a two day yoga heart camp. In this camp, people were given basic knowledge of CAD, yoga based better living, and yoga techniques. Later they were enrolled in the programme. The cardiologist, dieticians and yoga experts gave talks on different subjects. Regular follow up and monitoring was done by volunteers. The participants from the control group were followed at different venue by doctors as per conventional method of treatment without yoga.

**Questionnaire** - A comprehensive pre-tested questionnaire was developed to collect information about dietary patterns and frequency of consumption of various foods. Nutritional status was assessed using dietary parameters such as 24-hour food recall, food frequency and consumption. This was further compared with measurements of weight and body mass index.

**Dietary Instructions** - A record of biochemical parameters was analyzed and related to anthropometrical measurements and dietary intake. For reduction in fat content, complete stoppage of non vegetarian foods and overall reduction of fried foods was advised. Patients were also encouraged to take high carbohydrate (mostly complex carbohydrate providing

70% of calories). They were advised to take high soluble fiber diets consisting of vegetables and fruits, sprouted pulses, soybeans and fenugreek seeds. In addition, the diet advised was rich in antioxidants (carrots for beta-carotene, fruits for vitamin C, nuts like almonds and walnuts for vitamin E and flavonoids from colored fruits and vegetables and omega 3 fatty acids from flaxseeds). Change from refined sunflower oil to unrefined groundnut oil or olive oil was advised. Artificially flavored, packed foods, de-vitaminized or sprayed food, frozen food, colas, fast food, chocolates with high sugar and cream content, puddings and pies, full fat ice creams and biscuits made with refined flour were excluded.

**Periodic Assessments** - Patients from both the groups were assessed at 1, 3, 4, 6, and 12 month's period and simultaneously counseled individually and with their spouses. Changes in the lifestyle and diet were gradual. These were supported by regular hands on training on yoga techniques and illustrative recipes and menus with known nutritional values. Group counseling for stress and sattvik diet was done. Patients maintained a daily diary which included details of daily routine, menu, quantity of food consumed, timing of the meal, and experienced emotions. Support therapy was used as an integral part of the program. Family and spouses were met at regular intervals and the concept of family as a unit was explained.

**Tests and Analysis** - All the tests done during baseline assessment were repeated at the end of the study. For statistical analysis, group variables on a continuous scale were expressed as mean along with standard deviation and categorical data frequency with percentage. All statistical tests were two tailed and acceptance level of statistical significance in overall analysis was P-0.005. Comparative statistical analysis were carried out using ANNOVA.

### **OBSERVATIONS:**

**Calories** - The average total calories were 33.90 among Control group and 34.58 in Study Group at basal which was same and difference was not statistically significant. At the end of treatment the total calories significantly reduced by 31.5% in study group as compared to 23% in the controls.

**Fats** - In the beginning the average fats were 26.11 and 26.71 respectively in control and study group which was same and difference was not statistically significant. At the end the total fat content also markedly reduced by 47.2% as compared to 25.7% in the control group.

**Carbohydrates** - The mean carbohydrates were 54.09 among Control group and 52.71 in study group at basal which was same and difference was not statistically significant. At the end the complex carbohydrate content increased in the total diet by 24.1% as compared to only 11.8% in the controls. Though there was increase in both the groups, if you compare the increase was more in study group than control.

**Body Mass Index** - All overweight patients achieved near normal ideal body weights thus resulting in near normal BMI. The body mass index showed a fall of 4.2% in study group which was more as compared to 2.9% in control.

**Nutritional Values** - Average nutrition values (processed food) were 3.48 among Control group and 3.37 in Study Group at basal which was same and difference was not statistically significant. After treatment, at the end of 1.5 month only, mean levels were significantly increase in study group but in control group change were observed at the end of 3.5 month. At the end of 1 year, increase was 95.5% in study which were also significant as compared to 52.0% in control group. The average nutrition levels were 6.71 and 6.89 respectively in control and study group at basal which was same and difference was not statistically significant. After treatment, at the end 3.5 month only in study group mean nutrition level showed significant increase as compared control at the end of 8.5 month. At the end of 1 year, increase was 23.9% in study group as compared to 23.2% among control.

**Blood Sugar** - The mean fasting blood sugar value decreased from 196 mg% to 156 mg% in subject group as compared to 190 mg% to 174 mg% in the control group. Post prandial blood sugar value decreased from 260 mg% to 186 mg% in subject group as compared to 290 mg% to 240 mg% in control group.

**Blood Pressure** - Mean BP in subject group decreased from 166/94 to 136/86 mm Hg in comparison to control group which changed from 160/92 to 156/90 mm Hg. There was significant change in the anxiety level, personality traits and quality of life, after the program in the study group compared to the control group.

**Total cholesterol** - There was significant reduction in mean cholesterol level from 247.2 to 184.8 in the study group as compared to the decrease from 223.5 to 213.84 in controls.



**DISCUSSION AND CONCLUSION:**

The diabetic patients showed better balance in blood glucose levels, as shown above with the help of foods low glycaemic index foods (such as fenugreek seeds, sprouts) as compared to control group.

Blood pressure was better controlled as shown above due to weight reduction and cessation of processed foods and a diet high in fiber and potassium from fruits as compared to the control group.

At the end of the study period all overweight patients were near normal to their ideal body weights and there was significant reduction of serum cholesterol, LDL cholesterol and triglyceride, because of the high fiber, low fat, moderate protein and high complex carbohydrate diet as compared to the control groups.

Dietary modifications as per yogic way showed a significant improvement in overall risk factors, proved by improvement in MPI status and angiography.

Overall yoga based life style which included yogic diet and yoga techniques had a positive effect on control of risk factors. These effects were concordant with improvement in psychological parameters, myocardial perfusion status and coronary artery lesions as proved by different tests.

## **YOGIC MANAGEMENT OF OBESITY**

DR. SHARMA VK

**ABSTRACT:** Rishis developed yoga as a moksha shastra and healthy living is its by-product. Being the best form of healthy lifestyle ever designed, yoga is of immense relevance in today's world. Obesity is the medical condition in which excess body fat has accumulated to the extent that it may have an adverse effect on health, leading to health problems and reduced life expectancy. Currently, it is the most common nutritional or metabolic disorder in the developed countries. In India, about 20 % of children from public schools are overweight. Childhood obesity is already an epidemic worldwide and is further rising at an alarming rate. Obesity is measured by calculating body fat percentage (BFP), skin fold thickness, waist-hip ratio (WHR) and body mass index (BMI). Although, causes of obesity include genetic factors, age, metabolic disorders and drugs, the prime reason of obesity epidemic is faulty lifestyle and chronic stress of modern life. Yogic management of obesity includes 1) Lifestyle modification. 2) shodhana kriyas / detoxification process 3) breathing rectification 4) yogic practices including asanas, bandhas, mudras and meditation. When all these components are followed over a period of time, they can help in significantly reducing the obesity. Detoxification removes toxins from the body, asanas and pranayams increase the strength and endurance of muscles, aerobic capacity, bring balance in neuro-endocrine axis and meditative techniques decrease the stress levels, thus reducing anxiety and preventing binge eating. It is clear that there is a lot of scope of exploring yogic techniques in prevention and management of lifestyle disorders such as obesity.

### **INTRODUCTION:**

The word 'Yoga' is derived from Sanskrit word 'yuj' which means to unite and refers to the union of individual soul (atma) with universal Soul (Parmatma). The science of yoga deals with a man holistically, as this is the only science which takes into consideration both the 'psyche' and the 'soma' aspects of human framework. Our ancient cultural heritage of yoga has gained tremendous momentum in present times to become universally accepted

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philosophy as a way of life which gives the practitioners a healthy body, sound mind and alleviates stress and produces relaxation. Yoga was basically developed as a moksha shastra and healthy living is its by-product. Hence, yoga is of immense relevance in today's world. Scientifically, it is mind-body technique involving breath control, physical exercises and meditation which promote physical, mental, social and spiritual well being. There is a large body of scientific evidence that documents promotive, preventive and curative potential of yoga. Today, it is one of the top ten complementary and alternative medicine (CAM) systems practiced worldwide and its use is progressively increasing. Obesity is the medical condition in which excess body fat has accumulated to the extent that it may have an adverse effect on health, leading to health problems and reduced life expectancy. Obesity was virtually unknown till the beginning of 20<sup>th</sup> century but today it is the leading preventable cause of death worldwide and one of the most serious public health problems. Currently, it is the most common nutritional or metabolic disorder. It is a double tragedy for the world as half of the world is suffering from chronic starvation while rest of the population is suffering from the epidemic of obesity and its related disorders. Obesity is a complex condition with serious social and psychological dimensions that affect virtually all age and socio-economic groups and threaten to overwhelm both developed and developing countries. Today, one in three of the world's adults is overweight and one in 10 is obese. WHO estimates that by 2015, the number of obese adults will rise to nearly 2.3 billion — equal to the combined populations of China, Europe and the U.S. The magnitude of overweight ranges from 9% to 27.5% and obesity ranges from 1% to 12.9% among Indian children<sup>1</sup>. Childhood obesity is already a global epidemic and is further rising at an alarming rate.

#### MEASUREMENT OF OBESITY:

Obesity is measured by calculating body fat percentage (BFP), skin fold thickness (SFT), waist-hip ratio (WHR) and body mass index (BMI). BMI defines people as overweight (pre-obese) when their BMI is between 25 kg/m<sup>2</sup> and 30 kg/m<sup>2</sup>, and obese when it is greater than 30 kg/m<sup>2</sup>. Although, normal range for southeast Asian population is suggested between 18.5 – 22.9 as it has been found that risk of obesity-related diseases starts rising much

earlier in this population as compared to their western counterparts. BMI is an easy to measure and useful parameter but can be misleading if not considered along with WHR and BFP.

#### CAUSES OF OBESITY:

Causes of obesity include genetic factors, age, metabolic disorders and drugs. Prime reason of obesity epidemic is faulty lifestyle and chronic stress of modern day life. Faulty lifestyle includes following behavioral attitudes:

i) Consuming too many calories: Today, the trend of consuming foods which are calorie dense, overcooked and highly processed but nutritionally poor is increasing worldwide. Since, these types of foods have very less fiber content there is tendency to overeat them with little feeling of satiation. According to yogic literature, these foods items come in the category of rajasic and tamasic food type. Scientific evidence also suggests that prolonged consumption of such food items can lead to various types of carcinomas e.g. colon cancer.

ii) Leading a sedentary lifestyle: With the advent of all modern day facilities of transport and communication, people are leading more sedentary life. Lack of physical activity is the most significant factor in contributing to childhood obesity. Too much time is spent on sedentary behaviors like computer games and watching TV which may equal, or even exceed, diet quality as important contributors to overweight in adolescence.

iii) Excessive smoking, intake of beverages like tea, coffee, alcohol, colas: Consumption of these substances increase sympathetic activity thereby, causing persistent rise in the stress levels of the individuals

iv) Inadequate sleep: Sleep deprivation has been hypothesized to contribute toward obesity by decreasing leptin, increasing ghrelin, and compromising insulin sensitivity. Scientific studies strongly suggest that sleep duration is associated with obesity and weight gain<sup>2</sup>. Also, more and more people are working in various professions which force them to work in night shifts which is detrimental to their health

v) Modern day lifestyle exposes many individuals to constant stress which is taking a heavy toll on them. Anxiety disorders and depression as well as metabolic disorders

including obesity, type 2 diabetes mellitus and arteriosclerosis have all been linked to stress. Also, stress has been linked to biochemical changes that can trigger food cravings and binge eating episodes, ultimately leading to obesity.

#### OBESITY AS A RISK FACTOR:

Obesity has been implicated as a risk factor for large number of diseases such as diabetes mellitus, hypertension, coronary artery disease, psychiatric disorders including depression and poor self esteem, cancers of breast, liver, pancreas and colon, cholelithiasis, hypoventilation syndrome and osteoarthritis <sup>3</sup>

#### YOGA IN MODERN MEDICINE:

Mind-body medicine is now an established form of treatment. Four basic principles of yoga therapy for obese patient are: 1) Lifestyle modification. 2) Shodhana kriyas / detoxification process 3) Breathing rectification 4) Yogic practices including asanas, bandhas, mudras and meditation.

1) Lifestyle modification is essential for bringing healthy attitudes and practices which can help in the prevention and treatment of obesity. It involves restructuring of life schedule including following important components:

a) Cessation of smoking, alcohol intake and limiting the intake of beverages like tea & coffee etc. These beverages can be replaced with traditional beverages like flower and fruit juices, lassi, kanji, sattv etc which will be nourishing and non-addictive in nature

b) Adopting active lifestyle. Human beings work best when their bodies are active and mind calm, but today reverse is true. We hardly move around and our minds keep wandering creating continuous stress on us. Yoga practice is dynamic in nature and we should look for opportunities of physical and mental activity in our day-to-day life. Yoga practice for nearly 30 minutes to one hour daily can be a safe and

effective means to reduce the weight of obese individuals. Yoga should be introduced at the age of seven onwards.

c) Diet rectification (mitahara): Sattvic diet includes fresh sprouts, vegetables, cereal grains, fruits, legumes, nuts and unpasteurized raw honey. According to ayurveda, this diet inculcates sattva guna, leading to clarity and equanimity of mind and also nourishes the body. According to Hathayogapradipika, food should be agreeable, easily digestible and one should always eat food only up to 75% of stomach filled with remaining 25 % empty.

d) Healthy, positive thinking. Regular yoga practice regularly naturally helps in developing positive outlook in every situation of life

e) Ensuring adequate night sleep of 6-8 hours at fixed hours, preferably following the old age proverb of “Early to bed and early to rise” as much as possible.

2) Shodhana kriyas / detoxification process: Yoga gives utmost importance to the purification of mind and body for the ultimate transformation of self. Purification process removes accumulated toxins, impurities and diseases that tranquil the restless mind & regulates the body. It includes the practice of dhauti, basti, neti, trataka, nauli and kapalabhati. Dhauti cleans the entire digestive tract, basti and shankhaprakshalan completely wash the bowel, neti maintains healthy secretory and drainage mechanism of ear, nose and throat. Nauli kriya tones the abdominal muscle, excretory and digestive organs while kapalabhati kriya improves the functioning of respiratory and digestive systems.

3) Breathing rectification: Pranayama means expansion and regulation of prana. Prana is the vital energy in the body. On subtle levels, prana represents the pranic energy responsible for life or life force, and ayama means expansion and control. One can control the rhythms of pranic energy with pranayama and achieve healthy body and mind. Although pranayama techniques manipulate breathing in different rhythms and patterns, emphasis is on deep and slow breathing that reduces dead space ventilation, increases oxygenation of tissues, strengthens chest muscles and improves cardio-respiratory reflexes. Most useful pranayamas for obesity disorder are surya bhedi, bhramari, nadi-shodhana and

bhastrika. Suryabhedhi and bhastrika pranayamas stimulate sluggish metabolism and improve cardiac functioning and digestion<sup>4, 5</sup>. Nadishodhana literally means “channel cleaning”. Its regular practice increases parasympathetic activity<sup>5</sup> which produces relaxed mind, soothes anxiety, de-stresses the body, balances left and right hemispheres and promotes clear thinking. Likewise, bhramari pranayam also relaxes the mind and increases parasympathetic activity. Daily practice of pranayama has been hypothesized to alter the functioning of hypothalamic satiety center, thereby reducing binge eating episodes and reducing anxiety levels

4) Asanas, bandhas, mudras and meditation: Asanas represent third limb of ashtanga yoga. These are special postures that stabilize the mind through static stretching. They are somato-psychic in nature which means various reflexes are stimulated by adopting different yogic postures which ultimately affect the neuro-endocrine axis and mind of the practitioner. Set of asanas are special form of low impact exercises, rhythmic in nature with every flexion followed by extension associated with breath coordination. Practice of asanas causes gentle massaging of visceral organs and increases microcirculation in the tissues. It also increases the strength, endurance and flexibility of the body. Under proper supervision and using common sense, practice of asanas is totally safe and can be done even by morbidly obese and inflexible patients. Main asanas prescribed to obese patients will vary according to their suitability but usually include: suryanamaskar, tadasana, katichakrasana, trikonasana, pawanmuktasana, sarvangasana, matsyasana, halasana, bhujangasana, dhanurasana, ushtrasana, mandukasana, vajrasana, paschimottanasana, ardha matsyendrasana and relaxation postures such as makarasana and shavasana. According to principle of Viniyoga, all asanas should be practiced within 80 % limit of comfortable zone. Various bandhas & mudras are also useful in balancing neuro-endocrine axis of the body. According to Patanjali, goal of meditation is chita-vritti -nirodha i.e. control of disturbances activities of mind. Regular practice of meditation has been scientifically documented to reduce sympathetic activity, balance neuro-endocrine axis and decrease stress and anxiety levels<sup>6</sup>.

**CONCLUSION:** To summarize, various components of yoga therapy act through different mechanisms in concert to optimize the functioning of body and mind and thereby reduce the obesity of the patients. Detoxification/ shodhankriyas remove toxins from the body, asanas and pranayams increase strength and endurance of muscles, aerobic capacity and bring balance in neuro-endocrine axis. Meditative techniques decrease stress levels reducing anxiety and preventing binge eating. When all these components are followed over a period of time, they help in significantly reducing obesity. Therefore, there is a lot of scope of exploring yogic techniques in the prevention and management of lifestyle disorders such as obesity.

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## **IMPROVING AGNI AND APANA VAYU IN DIABETICS**

Dr. N. CHANDRASEKARAN, MBBS

Diabetes Mellitus is an ailment primarily originating from the Pranamaya kosha and its effects are felt in all the other koshas. Since the problem is originating from Pranamaya kosha, the therapeutic approach should focus on the balancing of the prana system. This is done by primarily working with breathing. All the yoga techniques that are used to bring out the therapeutic effect are appropriately modified to have a focused effect on the prana system.

### **FOCUS 1: TO WORK ON AGNI:**

According to yoga and ayurveda texts, there are different types of agni in the human constitution which are responsible for digestion, assimilation and proper integration into the constitution. The activities of the agni are regulated by the prana system in the constitution. The prana that are mainly involved in these activities are samana and vyana. Any imbalance in these vayu will result in reduced physiological activities of digestion and metabolism, which in turn will result in metabolic disorders like diabetes mellitus. So, the primary focus should be to work on improving the function of agni through samana and vyana vayu thereby correcting any metabolic imbalance. This focus is achieved in two steps.

The first step is to increase the potency of the agni. The ailment diabetes mellitus happens because of the reduced capability of this agni. Some of the techniques in yoga to improve the potency of the agni are trikonasana (parsva and parivrtti), jatar parivrtti (parsva and parivrtti) and ardha matsyendrasana. Long exhale and hold after exhale will improve the function of the jataragni. This can be done either alone or combined with asana practice.

The second step is to maintain the balance of the agni. Once the agni is balanced, yoga therapy should focus on the maintenance of its balance. Some of the techniques in yoga to maintain this balance are tadaka mudra, ardha uttanasana, ardha utkatasana, mahamudra, etc, Breathing techniques like samavritti pranayama, either practised alone or combined with these asanas will maintain the balance.

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**FOCUS 2: TO WORK ON APANA:**

According to yoga texts, apana is the region in the abdomen below the navel. Here, the physical, physiological, psychological and deeper dross are collected. A bigger bulge in the lower abdomen signifies a larger accumulation of waste products, ultimately leading to diseases. Diabetes mellitus is a condition where the entire metabolic chain is deranged. As a result, many metabolic waste products get accumulated in various parts of the body, more particularly in the apana region. All the later complications of diabetes mellitus occur due to this phenomenon.

Yoga firmly believes that everything is changeable. Even the accumulated metabolic waste can be removed through proper yoga practice. There is a segment of prana, namely apana vayu that is responsible for elimination of this accumulated waste. There are many techniques in yoga which can improve the function of this vayu, thereby improving the elimination of waste products. The techniques that can be used to work on the apana region and reduce the dross are apanasana, urdhva prasrita padasana, utkatasana, viparita karani, sarvangasana, etc. Long exhale and hold after exhale will increase the efficacy of these asanas.

**FOCUS 3: TO WORK ON AVOIDING FUTURE COMPLICATIONS:**

Diabetes is one condition that can affect the entire constitution. If left unchecked, it primarily affects the medium and small sized blood vessels and through this affliction, it affects the heart, brain, nerves, eyes, kidneys, bowel, bladder and feet. So, the focus of yoga therapy should also include techniques that will help to prevent these complications. Even if any of the above systems are already affected, then there are suitable techniques in yoga therapy to deal with the situation accordingly.

For example, in peripheral neuropathy condition, apanasana to urdhva prasrita padasana, supta baddha konasana, akuncanasana, dhanurasana, and so on can be applied with suitable modifications. To improve the coronary arterial perfusion, the techniques that open the chest region thereby improving the prana function can be applied. For example, tadasana, virabhadrasana, gentle standing and lying twists, and so on. Rechaka pranayama and langhana type of chanting will also help.

## **AN INNOVATIVE THERAPEUTIC APPROACH TOWARDS DIABETES**

Dr. PRAKASH CHINTAMANI MALSHE MD

Diabetes mellitus is a metabolic disorder characterized by hyperglycemia, disordered lipids and the attendant long-term complications. At its core are two abnormalities; a disordered function of pancreatic beta cells resulting in a delayed and sometimes inadequate insulin secretion and insulin resistance.

It is now well known that the insulin resistance is associated with obesity and it is still debated which is primary. The insulin deficiency is not absolute and about one third of diabetics have plasma insulin levels above the average.

As per our experience, Yoga can work much better for the primary prevention of the disease rather than when once the disease has developed.

The four major concerns which can be addressed by yoga are as under:

### **1. Obesity reduction:**

- a. *Mitahara*: This is a fundamental principle of yoga. The corresponding physiological principle is that nature has kept a great reserve everywhere. Therefore the appetite has been adjusted to a much higher level as compared to the need of the body. We can reduce the diet by half or even one-fourth of the felt appetite without losing a single kilo. Most of us have been eating much more than our requirement and for years together. *Mitahara* has been well defined by the yogic texts as filling of the stomach to its half. I suggest my patients and yoga students the following way: Measure your diet- on any average day, eat to your satisfaction, and side-by-side go on adding the same amount to another empty plate. After you finish eating, measure the quantity of food you have eaten. You may even be surprised looking at the quantity. Now onwards, consume only half of this. This reduces the caloric intake.

- b. A weekly fast: Inducer of hormone-sensitive lipase (HSL). In yoga, the second limb is *niyama*, and *tapa* is one of the five *niyamas*. The simplest *tapa* for a householder is to observe one-day-a-week fast. It is a general principle of physiology that whatever organs/systems/biochemical pathways we use are maintained in good function. Whatever we don't use goes into atrophy. Therefore, there is reason to believe that those who never fast, lose their HSL. This explains their difficulty in fasting. However, it is common observation that those who keep a regular weekly fast can tolerate it much better. This may be because their enzyme is in an induced state. The knowledge of physiology tells us that enzyme induction is detectable within 5 days and goes on till several weeks. Therefore when one starts observing a weekly fast, the sense of general weakness, 'sunkeness' etc all lasts for only 3-4 weeks. People should be given this explanation and encouraged to observe one weekly fast. In order to be really effective the fast should be observed taking only water and must be continued beyond 24 hours. It is then only that lipolysis starts. A clinical indicator is appearance of acetone in urine, which can be detected using simple dipsticks. This ensures that HSL has acted. Periodic Fasting for such duration should be recommended to keep the HSL in induced state. To the obese patients, this serves as a key which can be operated at will as many times a week as required to lose desired weight.
- c. Inverted asanas for 15-20 minutes: Atrial natriuretic peptide (ANP) releasers. The above mentioned HSL is acted upon by several hormones like thyroxine, adrenaline and glucagon. Recently, ANP has been found to do the same. That means anything that fills up and stretches the atria and stimulates release of ANP can be used for obesity. In yoga there are several asanas which invert the trunk and in this way cause increased atrial filling. They include *shirshasana* and *sarvangasana* and for those who are unable to do these, the method of using a hick rope hanging from the ceiling as advised by Shri BKS Iyengar should be used.
- d. *Suryanamaskara*: As described in the booklet 'Drink Air- Stay fit' it appears to be a series of manouvres designed to fill the intestines with air. With addition of *kaki-mudra* at the specified steps wherever the yogi becomes upright, air is sucked into the

stomach through the esophagus. Air distension of the gut is enough to create some satiety which makes it easy to stay without food for a day-long. There is reason to believe that this satiety is brought about by the release of GLP-1 which is a well known intestinal satiety-peptide and has multitude of functions. In case of difficulty in drinking air by Kaki Mudra, one can use Malshe's puncured straw technique of drinking air also described in the booklet mentioned above.

## **2. Reduction of cholesterol:**

a. Why the body synthesizes cholesterol? It has been studied that while our diet contains only 300 mg of cholesterol, about 1100 mg is excreted in the stool on a daily basis. All this cholesterol comes from the liver where it is synthesized and excreted in the stool. The purpose seems to be to prevent GI mucosal damage by enzymes, especially lipolytic and proteolytic ones. If we do not have digestive enzymes, we do not need cholesterol to protect our gut mucosa. So take predigested diet.

b. The protein myth: why do we require proteins in the diet? What for?

It is a myth that we require to have protein in our diet. The fact is we require amino acids. These we require to build various structural and functional proteins which have different half lives. The proteins synthesized once do not get destroyed quickly. Small quantities of keratin are synthesized everyday for maintenance of the skin, hair and nails etc. Structural proteins like collagen once formed stay almost for the lifetime. The muscle proteins are quite stable and do not have a large turnover. The plasma proteins have a half life of about 2 months. Haemoglobin has a life of 4 months. There is only one class of proteins that requires being synthesized everyday and the whole quantity is destroyed the same day. These are the digestive enzymes secreted in the gut- the salivary and pancreatic amylase, pepsin, trypsin, chymotrypsin, lipase, and the host of different saccharidases and peptidases. Studies have shown that an average person secretes about 60 grams of digestive enzymes in the gut. These can not be reabsorbed as such and have to be broken down themselves into constituent amino acids. This way the maximum turnover of amino acids is for synthesis of

digestive proteins. If we do not need to digest, we do not need to secrete digestive enzymes; so why not take predigested diet.

c. In praise of fruit diet: You must have seen big chunks of building material when some old structure is demolished. Every chunk contains hundreds of bricks and a lot of cement and sand. Would you use these chunks to build a new house or rather buy new bricks? Obviously buying new bricks saves a lot of labour of first breaking the chunks and separating the bricks. Moreover, in the process, many a bricks will be broken and will be unsuitable for use. But in terms of food we do the same. Mostly dietary proteins are those synthesized by the plants or animals for their use. First we have to break them down into the component amino acids. Fruits contain lots of amino acids. Some of their sourness and sweetness is due to this. Fruits also contain absorbable sugars other than glucose which do not require insulin for their entry into cells. In addition, one gets electrolytes, vitamins and fibre from them.

e. **Activation of beta cells:**

a. Air - filling maneuvers as described above. Air distension of the gut produces satiety which is likely to be mediated by some satiety peptide. It can be Glucagone-like-peptide-1 (GLP-1) which is a known incretin and is also known to have anti apoptotic and beta cell stimulating action. Hypoxia stimulates proliferation of various kinds of cells in the body and can help migration of stem cells from other locations like bone marrow.

b. Methods to produce brief, intermittent hypoxia: As described elsewhere, several yogic practices like bahya kumbhaka, nishshesha rechaka, nauli and agnisara lead to brief hypoxia. Some asanas such as yogamudra and pawanmuktasana are also conducive to hypoxia.

c. A one-day-a-week fast also increases survival of beta cells. Adipose cells, when saturated with fat secrete more of leptin and a number of 'Pro-inflammatory' cytokines. These lead to insulin resistance in the peripheral tissues. Some of these also deliver apoptotic signals to beta cells of the islets. No wonder, then, that a full

20% of the obese become diabetics. On the days of fasting, the adipose cells secrete much less of these chemicals, while the secretion of adiponectin increases. Adiponectin has anti-apoptotic, regenerative and proliferative effect on beta cells. In addition, on the day of fast, secretion of glucocorticoids is doubled. This can neutralize the effect of the pro-inflammatory cytokines, (without increase in blood glucose or blood pressure, as the individual is fasting). Therefore there is reason to believe that a periodic fast will go a long way in preventing diabetes in the obese. I have proposed a simple hypothesis, that a one-day fast postpones the onset of type-2 diabetes by 6 days. This way, a non-diabetic person can stay away from diabetes by simply observing a one-day-a-week fast. Those with established diabetes who are still obese can undertake even 2-day-a-week fast, of course taking precautions to avoid hypoglycemia. It may require closer monitoring of blood glucose on the day of fast, a reduction of doses in hypoglycemic drugs or changing from sulphonylureas to metformin.

#### **4. Prevention of vascular complications:**

- a. Hypoxia is an inducer of nitric oxide synthase (NOS). So any of the methods described above to produce brief, intermittent hypoxia is suitable for treating vascular complications. Generation of nitric oxide is beneficial in hypertension, coronary artery disease and erectile dysfunction.
- b. Asanas activate peripheral vessels and nerves and have an effect due to remote ischemic preconditioning.

## **ROLE OF ASANA-PRANAYAMA IN DIABETES**

Dr MANOJ NAIK MD

Diabetes mellitus, a pandemic by now is affecting and afflicting people around the world irrespective of race, religion, sex, class, and living standard. The number of patients and the projected complications are mindboggling in their enormity and strenuous on national health systems. The loss and pain caused by morbid chronic complications resulting from diabetes, early mortality and loss of productivity is incalculable.

With the advancement in science and technology, several new medicines and insights into the causes of diabetes and its complications have been discovered but then all these advances are unable to fully control the pandemic. Its incidence has risen enormously. Hitherto considered a disease of rich, it is now striking the poor and rural communities in developing countries.

A large contribution to the rising incidence of diabetes is from obesity, sedentary lifestyle, and over-eating, especially too much junk food. These form the basis of lifestyle disorders. Under such a dismal scenario, in order to tackle this disease, collaborative efforts are required between various allied and alternative branches of modern science.

As per medical science, the human body comprises several systems: respiratory, digestive, cardiovascular, genitourinary, nervous and musculo-skeletal system to name a few. Diabetes is a disease afflicting the pancreas, and also the liver, intestines and the muscles in particular, leading to deficiency of insulin secretion or its action or both.

In recent years, much research has turned focus on whether the power of yoga can be harnessed to effectively address the pandemic of diabetes on three levels:

1. To keep a healthy human being from getting diabetes
2. To prevent a person with pre-diabetes from progressing to type 2 diabetes and
3. To help a diabetic avoid developing further complications from the disease.

Yoga, an ancient philosophy, science and art deals with human life, sufferings and the means to eradicate them to attain emancipation. It is a universal subject and can be practised by all.

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## **YOGA AND ITS EIGHT LIMBS**

It is also called ashtanga yoga i.e yoga of eight limbs or petals and they are:

1. Yama (universal morals) covering ahimsa, satya, asteya, brahmacharya, aparigraha
2. Niyama (individual observances) are shaucha, santosha, tapa, svadhyaya and iswara pranidhana
3. Asanas (postures): The numerous positions of the body which we are familiar with
4. Pranayama: regulation of life force (prana) with the use of breath
5. Pratyahara: withdrawal of senses from objects of pleasure
6. Dharana: focusing attention on a single point or locus (concentration)
7. Dhyana: maintaining this attention uninterruptedly (meditation) and
8. Samadhi: After a period of dhyana (meditation) the distinction between the subject (individual) and the object (being meditated upon) is lost and both appear as one. This is samadhi.

Yama and niyama are to be observed and not preached. pratyadhara, dharana, dhyana and samadhi are advanced practices that are developed after years of training. Thus, one can start with asanas followed by pranayama.

## **YOGIC CONCEPT OF EMBODIMENT**

According to yogic science humans are made up of 'purusha' (soul) and 'prakriti (matter). the latter is made up of several principles as given below.

The Yoga philosophy has studied the body comprising the following principles:

1. Chitta, manas, buddhi and ahamkara
2. Panchamahabhutas, the earth, water, air, fire and ether (space)
3. Panchatanmatras: shabda (sound), sparsha (touch), roopa (form), rasa(taste) and gandha (smell)
4. Five sense organs: eyes, ears, nose, tongue, and skin

5. Five motor organs: karmendriyas: two arms, two legs, organs of speech, genitals and excretory organs.

It also has five layers or koshas that are:

1. Annamaya kosha (musculo- skeletal body)
2. Pranamaya kosha (organic body - consists of various vital organs, heart, liver, spleen, pancreas, kidney, etc.)
3. Manomaya kosha (mental body)
4. Vijnanamaya kosha (body of intelligence)
5. Anandamaya kosha (body of bliss)

Hence as per yogic science diabetes mellitus is a disorder of pranamaya kosha (organic body). The function of yoga and especially asanas (postures) is to penetrate all these sheaths and enhance the function of all these organs to ultimately conquer them. The annamaya kosha (anatomical body) is used to exercise the pranamaya kosha (organic body) so that the vital energy reaches these organs, keeping them in good shape. This action (organic exercise) is unique only to asanas and no other form of exercises. These asanas churn, squeeze, massage, compress and rotate the organs thereby improving the blood circulation and thus keeping them healthy.

## **ASANAS AND DIABETES**

Asanas mean a seat or posture. They represent the third limb of ashtanga yoga. According to Shiva Samhita, there are eighty four lakh asanas that have been evolved by our great sages and rishis for the benefit of the mankind. To an onlooker, asanas may look like physical exercises, gymnastics or even acrobatics. However, the deeper, inner and higher effects are realised and felt only by the practitioner. The higher effects can be experienced by the practicing sadhaka, in correctly done asanas. Correct effects come from precise, accurate placements of the body parts. Incorrect placements can yield wrong effects too. In fact, asanas are an experimental science. The yogis have used the body as a means and tool to study nature or prakriti. The yogis have used their own bodies to study and assess nature assuming shapes

of various objects (e.g. trikonasana - triangle pose), animals (e.g. makara asana - crocodile pose), vegetation (e.g. vrksasana - tree pose), birds (e.g. kapotasana - pigeon pose), and gods. Asanas initially develop a strong, fit body which is used for further spiritual development. Its ultimate effect is soul realization and abolition of dualities. For a yogi, asanas are prayers and meditation.

Yogacharya BKS Iyengar, the great modern living legend in the field of yoga, has worked and developed the universally applicable limbs of yoga - the asanas and pranayama. His tapasya of 75 years and realization of the depths of these are the basis of this article. Seemingly difficult or near impossible asanas are brought within the range of common man by use of simple objects called props. Patients are able to do precise, accurate poses with these aids and obtain their benefits. Guruji, as BKS Iyengar is known, has explained numerous benefits of asanas based on his comprehensive subjective experiences. Asanas are multifaceted and they render us holistic health. This includes physical, organic, mental, ethical, moral, intellectual, emotional and spiritual health.

### **ASANAS HELPFUL FOR DIABETICS**

Modern science has several drugs in its therapeutic armamentarium. These include sulfonylureas, biguanides, glitazones, alpha-glucosidase inhibitors, DPP-4 inhibitors and insulin. They have been studied and developed in laboratories and experimented on animals (experimental physiology and pharmacology). After a lot of research, drugs were tested and then finally brought into clinical practice.

A similar approach is used for therapeutic methodology in asana practice by Guruji. Several asana have been developed, modified or altered to suit diabetics. However, these have not been tested on laboratories or animals. He has worked them using his own body as an experimental animal or guinea pig. This intense subjective research has shown the effects of asanas which are given below.

Asanas work comprehensively on all principles of prakriti and all sheaths (koshas) of body to ultimately conquer prakriti. The vital energy or life is made to flow all over the body to keep all parts healthy. The anatomical body (annamaya kosha) is used to exercise the organic body

(pranamaya kosha). The vital energy reaches these organs and keeps them in good shape. Gururji calls these effects as organic exercises. All forms of exercises, sports, gym and activities have effects mainly on muscles, joints and bone, while they have negligible effects on the organs or systems. This action is unique only to asanas. They use various skeletal parts to exercise these organs. These organs are attached loosely to the posterior abdominal wall and by themselves cannot do any action. In various postures these organs are compressed, squeezed, churned, rotated, extended and massaged. This increases their blood supply and enhances their function.

Diabetes is a disease affecting pancreas. Other organs important in glucose metabolism are liver, intestines, muscles and fat (especially central fat). According to yoga, diabetes is a disease of pranamaya kosha affecting the organs. These are tackled in a way shown below in various illustrations of asanas. They not only affect the organs but also help in the following ways: body remains healthy. Stiffness (e.g frozen shoulder, common with diabetics) is avoided. Mind is fresh. Appetite regulation is more spontaneous. Proper foot shape and arches are maintained (which has great preventive role for diabetic foot injuries). Cardiovascular health can also be maintained by asanas. Certain asanas work on the renal system in an enhanced way, this result in proper bladder control. Asanas also benefit the kidneys.

Hypertension and ischemic heart disease often accompany diabetes. Also, long term complications of diabetes affects heart, kidney and virtually every organ. Depression and low self-esteem occurs in some patients due to chronic illness. Often some lasting irreversible complications also cause a similar low feeling. Here, asanas work profoundly on mental sheath (manomaya kosha) and eliminate such feelings.

Several diabetic complications may be irreversible and crippling. Here too, yoga philosophy helps. It says *heyam dukkhamanagatam*: Those sufferings or diseases which can't be avoided must be endured as per yoga philosophy. Yoga fortifies the body and mind to endure the sufferings which cannot be avoided. Medicines play a role only after the patient develops diabetes, but asanas work on everybody well before the onset of diabetes. Post diabetes they help the failing pancreas by organic exercise. Effects of diabetes on other organ system is also minimized or delayed with regular asana practice. Enhanced mood and change of personal

outlook result in positive mental frame, wherein a patient is confident of controlling his disease. Few asanas, beneficial for diabetics are given below:

Virasana (warrior pose)	Jathara parivartanasana (abdominal twist)
Sputa virasana (supine warrior pose)	Urdhwa mukha shwanasana (upward facing dog pose)
Paschimottanasana (left body stretch)	Sirsasana (head stand)
Marichyasana - 3	Sarvangasana (complete body pose)
Ardha matsyendrasana (half fish pose)	Viparita dandasana (reverse prostration)
Navasana (boat pose)	Urdhwa dhanurasana (bow pose)
Ardha navasana (half boat pose)	Setubandha sarvangasana (bridge stand)
Paripurna navasana (full boat pose)	Urdhwa pranita padasana (leg lift)

## **PRANAYAMA**

Pranayama (prana life force, ayama: expansion) means expansion of the life force and is done with the help of the breath, but life force and breath are separate. In pranayama the life force is accessed using breath as a tool. A sharp, sensitive mind to observe subtle movements of breath is also a prerequisite for Pranayama. Asana practices for up to a period of six months to a year should make an individual ripe for starting pranayama practices. No sooner does one achieve reasonable proficiency in the above asanas, ujjayi pranayama, vilome pranayama and pratilome pranayama are next recommended under the guidance of a competent teacher. It is introduced in savasana with spine supported by bolster and while sitting. The components of breathing are: puraka (inhalation), antara kumbhaka (internal retention after inhalation), rechaka (exhalation) and bahya kumbhaka (external retention after exhalation). Ujjayi pranayama, viloma pranayama and pratiloma pranayama are recommended for diabetics.

Customarily, walking for 45 minutes or so, five times a week is recommended as one of the most important practice by many diabetic associations. But this rule ignores a basic limitation: much too often, diabetics suffer from heart ailments too, which may not permit walking for long. Osteoarthritis of knee and hip may also hinder this practice. Also, that retinopathy (reduced vision), diabetic foot (neuropathy, peripheral vascular disease, ulcers, calluses, etc.) may also restrict walking. For such people asanas are the best answers to all their problems.

## **WORDS OF CAUTION**

Yogic science says that proficiency in the practice of asanas is necessary and in particular before initiating pranayamic practices. If not done correctly it can cause harm to the sadhaka (one who is performing pranayama). The prana therefore needs to be controlled very slowly and cautiously through the breath. Often, people start pranayamic practices directly without first practicing the asanas. They may end up practicing yoga in a haphazard manner. Pranayama generates tremendous vital energy and needs a network for its correct distribution and to prevent dissipation, which is done by bandhas. Asanas create correct nadis (channels of energy) for distribution of this energy but if the prana flow is erratic or forceful, it can injure the nadis and the nervous system. This explanation should be enough to prevent the readers from looking at few pranayama practices as an answer for all ills including diabetes. Incorrectly done pranayama can have side effects. People tend to view pranayama as a panacea for all ills, which is medically wrong and against the principles of yoga.

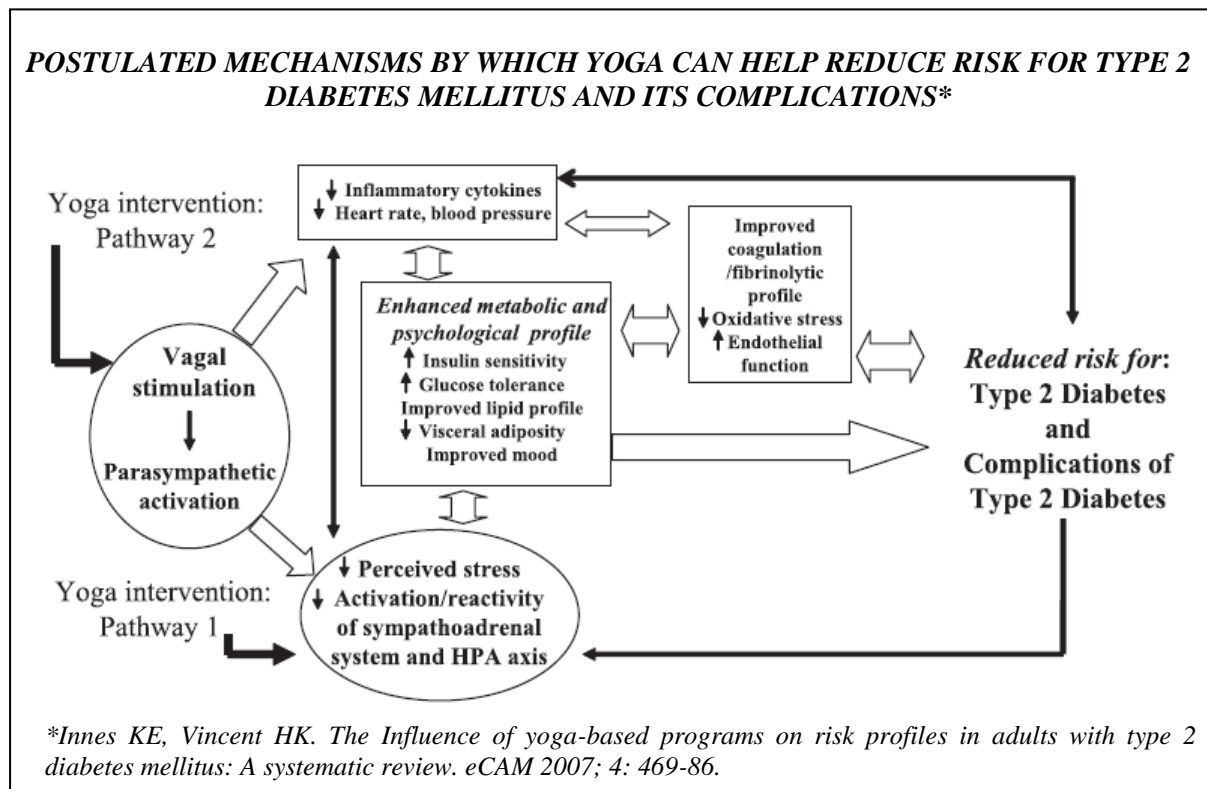
Why is this caution necessary? Breathing is dependent on the rib cage (ribs, thoracic, spine, sternum and their articulation), lungs and respiratory muscles. For efficient and deep breathing necessary for pranayama, these joints of the rib cage have to be kept mobile. Lungs need to be elastic and the respiratory muscles efficient, which is done with various asanas.

## YOGA PRACTICES FOR PREVENTION AND MANAGEMENT OF DIABETES MELLITUS

Yogacharya Dr ANANDA BALAYOGI BHAVANANI

Yoga is an integrated way of life in which awareness and consciousness play a great part in guiding our spiritual evolution through life in the social system itself by understanding that "yoga is the science and art of right-use-ness of body, emotions and mind".

Yoga can play a major role in prevention and control of diabetes mellitus that is turning out to be one of the major killers of the modern world. Yoga is of special value to those suffering from type-2 or non insulin dependent diabetes as it helps to sensitize the body cells to the insulin and helps the body fight the hyperglycemic state in an effective manner. The healthy exercise and weight loss produced by yoga as well as the dietary aspects when followed religiously and regularly can help prevent and control this disorder to a great extent.



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## **YOGA THERAPY FOR DIABETES:**

1. **Exercise:** It is important to use up the excess blood sugar by regular exercise. Walk whenever possible and skipping or swimming are good adjuvant to yoga therapy.
2. **Diet:**
  - Regular small meals with complex carbohydrates.
  - Avoid refined foodstuffs and junk food.
  - Take lots of green vegetable salads, bitter gourd and neem.
  - Maintain good hydration.
3. **Suryanamaskar:** Performance of three to six rounds of suryanamaskar helps to utilize the excess glucose and also to help speed up metabolism and weight loss.
4. **Asanas:**
  - **Twisting poses:**
    - ◆ **Standing:** Trikonasana, ardhakati chakrasana
    - ◆ **Sitting:** Vakrasana, ardha matsyendrasana, bharadwajasana, shashangasana
    - ◆ **Reclining:** Jatarapariivartansana
  - **Abdominal pressure poses:**
    - ◆ **Sitting:** Utkatasana, janushirasasana, pashchimottanasana, navasana, yogamudrasana, stambam asana and mayurasana.
    - ◆ **Reclining:** Pavanamuktasana, dhanurasana, bhujangasana, shalabhasana, noukasana
  - **Topsy turvy:** Sarvangasana, janusirasa in sarvangasana, karnapidasana and halasana
5. **Pranayamas:**
  - Vibhaga and pranava pranayamas with special emphasis on adam pranayama and AAA sound.
  - Bhastrika pranayama to utilize the blood glucose.
  - Savitri pranayama, chandra anuloma pranayama, nadi shuddhi pranayama for stress reduction



6. **Kriyas:** Kunjal, nauli, kapalabhati, agnisara, shankha prakshalana
7. **Mudras and Bandhas:**
  - Viparita karani and mahamudra.
  - Uddiyana, moola and jalandhara bandhas.
8. **Relaxation:** Shavasana, makarasana and kayakriya.
9. **Dharana:** Mandala dharana on all chakras with emphasis on manipura chakra and the sound of RAM (RUNG)

### **BASIC WARMING UP PRACTICES**

Jattis are basic movements of the body parts that help to release pent up tension in those parts. They increase circulation to the part and also the flow of pranic energy is increased due to the movements. A few of these practices will be described now.

Take up a comfortable standing position such as the samasthitiasana. Stand on one leg and shake the other leg. Repeat on the other side and then alternate a few times between right and left. Stand on both legs and start to shake your hand one at a time. Alternate between right and left hand a few times and then start to shake both hands, at the same time. Shake your hands and move them up, down, to the left and to the right. Shake your hands all around you in a circular movement. This helps to energize the Pranamaya kosha, our energy sheath or subtle body. Come back to the standing position.

Open the legs two feet apart and keep the hands on the hip. Move the torso in all four directions clock-wise and anti clock-wise in a grinding action. Then do it in a continuous manner. Bend forward and perform some toe touching with a bouncing action. Bounce to the front, and then move to your left. Move to your right and then come back to the front. Come back to the standing position.

Spread your feet a bit and lift both your arms to the side. Start to twist your torso from side to side a few times. Feel the stretch in your hip region and back. Come back to the standing position and relax with deep breathing for some time.

Sit down with both legs stretched out in front of you. Draw your right knee up to your chest and then kick out with a whooshing sound. Perform the same action on the left side. Continue to alternate legs for some time. Draw up both your knees and do the same action with a whooshing sound as you release the feet. Relax with your feet stretched out in front.

**SURYA NAMASKAR:** Rishikesh suryanamaskar, the yogic sun salutation is a series of twelve physical postures. These alternating backward and forward bending postures flex and stretch the spinal column through their maximum range giving a profound stretch to the whole body. The basic breathing principle is to inhale during upward and backward bending postures and exhale during forward bending postures.

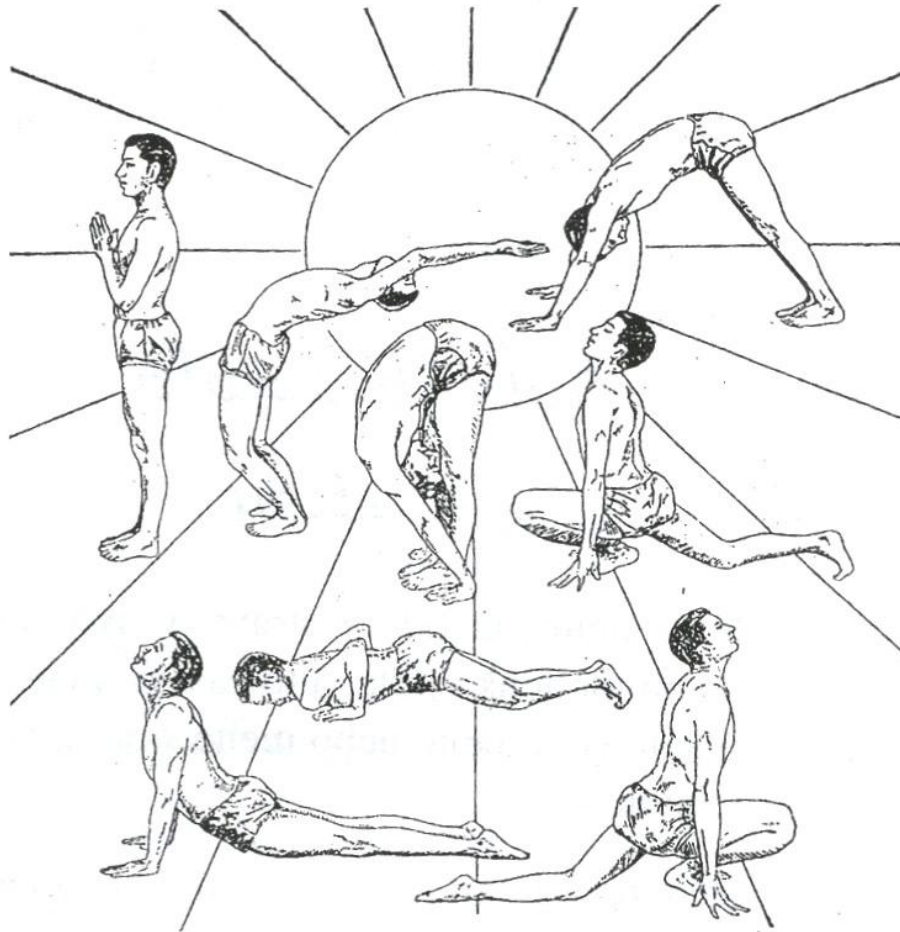
Stand erect with your feet close together. Perform namaskarmudra by joining your palms together in front of your chest. Breathe in and stretch your arms over your head into the anjalimudra and then arch your back. Feel the healthy stretch in your whole body.

Breathe out and bend forward while keeping your arms and back in one line and as straight as possible. Perform the padahasthasana by bringing your head to your knees while keeping your hands on either side of your feet.

Breathe in and extend your right leg back until it is as straight as possible and you are balanced on your toes and hands. Your left leg should be bent with the sole flat on the ground. Lift your head, bend back and open up your chest. This is ashwasanchalanasana, the equestrian posture.

While breathing out bring your left leg back towards the right and keep the feet just a foot apart with your heels flat to the ground. Simultaneously raise your buttocks and lower your head between your arms, so that your body forms a triangle with the ground. This is meruasana or mountain posture. While maintaining the posture, take a deep inhalation.

While breathing out drop both knees to the ground and slowly slide the body down at an angle and bring your chest and chin to the ground. Eight parts of your body namely your toes, knees, chest, hands and chin should touch the ground while the buttocks are kept up. Hold out your breath while performing this ashtangabhūmisparsha, the eight limbed prostration.



Breathe in and come into bhujangasana, the cobra posture. Focus your awareness at the base of your spine and feel a healthy stretch in your back and neck.

Exhale and come back to the meruasana, the mountain posture. This strengthens the muscles of the arms, legs and entire back.

Inhale and bring your right leg forward in-between your hands while keeping your left leg in its original position to perform the ashwasanchalanasana. Breathe out and bring your left foot forward to come into the padahastanasana.

Breathe in and come up and perform the anjalimudra and bend backward. Breathe out and come back to the standing position while bringing your hands back to the chest in namaskarmudra.

To perform the Rishikesh suryanamaskar on the opposite side perform the practice again with a slight modification. To complete the other half the same movements are repeated except that the left leg is brought back while performing the ashwasanchalana the first time. The other postures such as meruasana, ashtangabhumisparsha and bhujangasana are done in the same manner. When coming back to ashwasanchalana, the left foot is brought forward and then padahasta is performed by joining right foot to the left before completing the practice with the anjali mudra. Finally relax in samasthiti with deep breathing.

One full round consists of these 12 poses done twice in sequence. Practice 3 to 9 rounds daily for maximum benefit. When the exercises are done little quickly the gain is more physical and when they are done slowly with breath awareness the gain is more mental and spiritual.

## **YOGA ASANAS**

**TALA KRIYA:** The term, “tala” refers to a palmyra tree and you should try to stretch yourself tall as that tree while performing this practice. Take up a comfortable and stable samasthitasana. Breathe in and lift both arms up over your head until they are parallel to each other. Let the palms of both hands face inward and then go up onto your toes and stretch up as high as possible. Hold the breath and feel the healthy stretch along your whole body from toes to finger tips.

Breathe out and relax your arms back to your sides while coming back to the flat foot posture. Repeat the practice two more times at each session for maximum



benefit. With practice the posture can be held for a longer time and normal breathing done while holding the posture for 30 to 45 seconds.

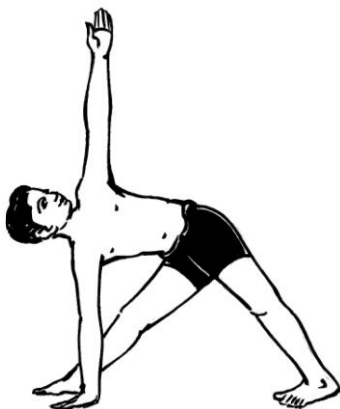
**HASTHAKONA KRIYA (Ardhakati chakrasana):** Stand in steady samastithiasana with your arms by your side. Breathe in and lift your right arm over your head. Try to extend the arm over your head towards the left as far as possible without bending it. This gives a good stretch to the entire right side of the body. Slowly breathe out and lower your arm back to the side. Repeat it a few times.



Make sure that you lift your arm on the in breath and lower it on the out breath. Perform the practice on the opposite side by lifting your left arm over your head while breathing in. Extend it as far towards the right as possible without bending it. Feel the excellent stretch on the entire left side of your body. Lower your arm back to your side while breathing out. Repeat the practice a few more times.

Hasthakona kriya helps to stretch and tone up the musculature of the arms, shoulders and the para-spinal area in a way not done in day-to-day life. This helps trigger the relaxation response in these tissues that are normally tensed due to disuse, misuse and abuse. A sense of profound relaxation is obtained after the practice of this activity.

**TRIKONA ASANA:** Stand in samasthithiasana. Place your feet two to three feet apart facing forwards. Stretch your arms to the sides so that they are pulling the chest in opposite directions. Turn your head and right foot to the right side and slowly bring your right hand down to the right foot and place the palm of the right hand on the ground in front of the right



foot. Look up at the middle finger of the left hand. Let the entire torso get a good twist and stretch. Hold the position for 30 seconds while performing regular breathing. Release and come back up to the open arm position and then do on the opposite side by placing your left hand down in front of the

left foot. Hold the position for 30 seconds while performing deep breathing. When ready come back up to samasthithiasana and relax with a few rounds of deep breathing.

**VAKRA ASANA:** Sit erect with your legs stretched out in the uttanasana. Bend your right knee and place the right foot by the side of the left knee. Turn to your right and place your right hand on the ground behind you to support your erect position. Bring your left arm round the outer side of the right knee and catch hold of the right big toe. Turn your head and look back over your right shoulder. The erect knee acts as a fulcrum for getting maximum twist of the spine. Keep your torso as straight as possible. Hold the posture for 30 seconds with soft breathing.



Release the posture and come back to the uttanasana. This posture gives an excellent massage to the abdominal organs and is very useful for those suffering from diabetes as well as digestive disorders. It is also useful for neck and back problems. Repeat the practice on the opposite side in a similar manner. Hold the posture for 30 seconds with soft breathing. Release the posture and come back to the uttanasana and relax with deep breathing for some time.

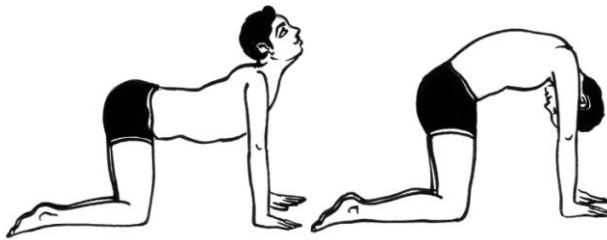
**ARDHA MATSYENDRA ASANA:** Sit erect with both legs stretched out in front and your palms gently pressing on the ground by your sides in uttanasana. Fold your right knee and place the heel tight in against the perineum. Place your left foot by the side of your right thigh by crossing it over the knee. Bring your right arm round the outer side of the left knee passing between the chest and the knee and catch hold of the left big toe. Your right shoulder blade rests on the outer side of your left knee.



Take your left hand round your back and try to get a grip on your right thigh. Look back over your left shoulder. The erect knee acts as a fulcrum for getting maximum twist of the spine. Keep your trunk vertical. Hold the posture for 30 seconds with soft breathing. Repeat on the opposite side and hold the posture for 30 seconds with soft breathing. When

you are ready slowly release the posture and come back to the uttanasana.

**CHATUSH PADA ASANA AND VYAGRAHA PRANAYAMA:** Take up the chatuspadasana with your weight evenly distributed between your hands and knees. Start breathing in and out each for a count of six. While breathing in slowly lift your head and arch your back downwards. Then breathe out slowly and lower your head while arching your back upwards. Breathe in while lifting your head and arch your back down.



Breathe out while lowering your head and arching your back up. Repeat this excellent practice at least nine times at each session. Vyagraha pranayama helps us to utilize all sections of our lungs in a balanced and controlled

manner thus energizing the whole body with healing pranic energy. When ready, slowly relax back to vajrasana for a period of quiet contemplation.

**BHUJANGINI MUDRA:** To perform the cobra gesture, take up unmukhasana which is a prone position with your entire body in a straight line. In this technique the emphasis is on breathing pattern and production of a mighty hissing sound through the clenched teeth. Slowly bring your arms forward and keep your palms on the ground alongside your shoulders. Take in a deep breath. While making a mighty hissing sound, flare back into the bhujangasana. Slowly relax back onto the floor while breathing in and then again flare back with a mighty hiss. Repeat this Mudra at least three to six times at each session. This technique helps release the pent up stress that accumulates in our system from our daily life and provides great emotional and mental relief.

It is an excellent stress-buster and is a must for all in this day and age. After completing the practice come back down to the face prone pose. Place your arms



alongside your body and turn your head to the side. Relax for a few minutes and let the benefit of this mudra seep into each and every cell of your body.

**PAWAN MUKTA ASANA:** Lie down in a comfortably in shavasana and start to breathe in and out for an equal count of six or eight. To perform the single legged ekapadapawan muktasana, bend and lift your right knee while breathing in and simultaneously also lift your head off the ground. Catch hold of your knee with your arms and try to touch your knee to your forehead. Hold the position for a few seconds and then while breathing out slowly release the position and lower your head while at the same time bringing your foot back to the ground.



Repeat this at least two more times to complete a set of three rounds of the practice. Relax a few seconds in the shavasana and then perform the practice on the left side. Relax in shavasana for a few minutes with deep and rhythmic breathing while concentrating on your abdominal area that will help to relax you further.



To perform the double legged dwipadapawanmukta asana, bend and lift both your knees while breathing in. Bring them as close to your forehead as possible while simultaneously raising your head to meet the knees. Hold for a few seconds and then while breathing out, lower your head and simultaneously bring your feet

back to the ground. Repeat this two more times to complete a set of three rounds at each session. Relax in shavasana for a few minutes with deep and rhythmic breathing while concentrating on your abdominal area. This will help you to relax even further as the emotional tensions tend to tighten up the abdominal area leading to a feeling of “butterflies in the stomach”.

**EKA PADA UTTANPADA ASANA:** From shavasana lift your right leg up towards the sky on the in breath. Try not to bend the knee if possible. On the out breath



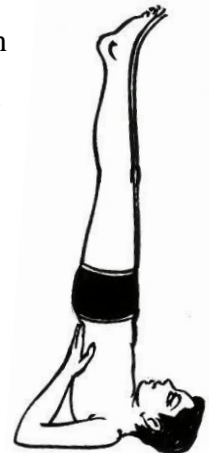


lower the leg back to the ground. Use a breath cycle of in and out for a count of six or eight. Repeat this two more times. Perform the same practice on the left side. Repeat this two more times. After performing the practice at least three times on each side relax in shavasana with deep breathing.

**DWI PADA UTTANPADA ASANA:** From shavasana lift both legs up towards the sky on the in breath. Try not to bend the knees if possible. On the out breath lower the legs back to the ground. Use a breath cycle of in and out for a count of six or eight. Repeat this two more times and then relax in shavasana with deep breathing. Those who have back problems should not do straight leg lifting and should do it with bent knees instead to avoid strain on the back.



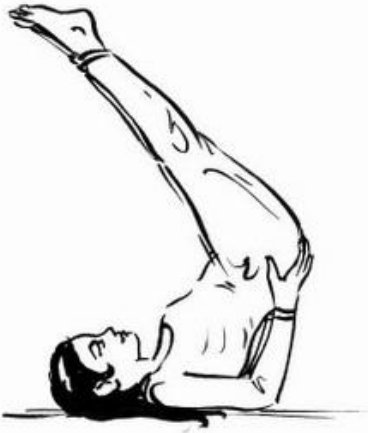
**SARVANGA ASANA:** Lie down in shavasana. Breathe in and lift both legs at a time until you are in the dwipadauttanpadasana. Continue the upward motion and lift your back off the ground using both arms to support the lower back. Keep your trunk and legs in a straight line by supporting the entire trunk on the shoulders. Breathe in a shallow manner while concentrating on the healthy pressure at the throat region. Release the posture after 10 to 15 seconds and while breathing out slowly come back to the Shava Asana. Roll your head from side to side to ease away any pressure that may have accumulated in the neck. After a short relaxation, repeat the practice two more times.



**VIPARITA KARANI:** Viparitakarani is the shoulder stand-like mudra where the weight of the body is supported by the elbows while the hands are placed against the pelvic girdle. From the supine shavasana slowly lift both your legs up as if performing sarvangasana. However the weight of your body should be balanced on your elbows and arms and not on your shoulders. Hold the posture in a comfortable manner and then start to perform the incomplete and complete actions of this mudra.

Perform the incomplete action by taking a deep inhalation and bringing your straightened legs towards your head so that your body makes an acute angle. Then perform the completed action by pushing your legs away while exhaling the breath. Make sure that your feet are extended in a rigid position making an obtuse angle.

Breathe in bringing your feet towards your head 1-2-3-4-5-6. Breathe out pushing your feet away 1-2-3-4-5-6. Continue the practice for a minimum of three to nine rounds of this alternation between the incomplete and complete postures with the breath cycle at every session.



This mudra promotes a healthy metabolic function by stimulating the pancreas and the uptake of insulin by cells of the body. It is highly recommended for the prevention, control and possible cure of conditions such as diabetes mellitus and imbalances of the thyroid gland. When ready slowly bring your legs down to the ground in a phased manner and enjoy a quiet period of relaxation in shavasana.

**SHAVASANA WITH SAVITRI PRANAYAMA:** Lie supine on the ground with your head preferably to the north enabling your body to be in alignment with the earth's electromagnetic field. Make sure that your head and body are in a straight line while hands are kept relaxed by the side with palms facing upwards. Bring your feet together and let forefeet fall away into a 'v' shape with heels as close together as possible.

Start to consciously watch your breath by letting your awareness settle in the abdominal area. Feel the abdominal movements as your abdomen rises as you breathe in and falls as you breathe out. After a few rounds of this practice, slowly let your awareness settle at the tip of your nose. Feel the cool inspired air flowing into your nostrils as you breathe in and become aware of the warm expired air flowing out of the nostrils when you breathe out. Consciously regulate your breath so that the duration of the incoming and outgoing breathes are equal. The inspiration and expiration can be for a count of 4 or 6 initially and then with practice

increased to a count of 8 or 10. Perform at least nine rounds of this conscious deep breathing and enjoy the relaxed sensation that spreads throughout your body.

The relaxation in shavasana can be further deepened by utilizing savitri pranayama to relax and rejuvenate your body, emotions and mind. Breathe in through your nose for a count of 6. Hold in the breath for a count of 3. Breathe out through your nose for a count of 6. Finally hold the breath out for a count of



3. This is one round. Perform at least 9 rounds of this combination

practice that heightens the relaxation to a very deep level. Make sure that you are breathing in and out through both nostrils and that you are using the complete yogic breathing.

After performing shavasana for 10 to 15 minutes, slowly start to move your fingers and toes. Perform conscious stretching and make a smooth transition from the relaxed to the active state. Lift your left arm over your head and turn over to your left side. Continue the turning action until you come into the face-prone posture. Perform makarasana by placing your right hand on the left while the left is placed palm down on the ground in front of you. Keep your forehead or chin on your right hand while keeping your legs a foot apart.

Bring your hands forward near your shoulders and push yourself back into the bhujangasana. Continue the back bending movement and go into the four footed chatushpadasana. Relax into the shashangasana with your arms stretched out in front and then finally come back to the vajrasana. With your palms on your thighs sit quietly for some time and enjoy the effects of the deep relaxation that has spread to every part of your body.

**SPANDA – NISHPANDA KRIYA:** This practice is done from shavasana using the yogic concept of spanda-nishpanda, which means the coupling of tension and relaxation. We consciously tense different parts of our body as much as possible and then relax them to the maximum in a step-by-step manner. This produces a better relaxation response than the mere attempt to relax without putting in the initial effort of tension.

Lie down in a comfortable supine shavasana with your entire body in a straight line. After a few seconds of relaxation in this position, start to tense your entire body part-by-part from your toes up to the top of your head until every part of your body is as tense as possible.

Hold this 100% tension state of spanda for a few seconds. Let all the muscles of your entire body be as tense as possible.

At the peak of the tension, just 'let go' and immediately relax your entire body 100%. This is the state of nishpanda. Enjoy this relaxed state and with conscious awareness continue to watch your breath as it comes in and goes out of your nose.

Repeat this practice again by tensing up your entire musculoskeletal system to the state of spanda and hold it for a few seconds. When ready let go completely and enjoy the nishpanda state for a few minutes.

To complete the practice repeat the spanda – nishpanda kriya a third time by tensing up your entire musculoskeletal system from your toes to the top of your head. Hold the complete tension for a few seconds. When ready, let go completely and enjoy the complete relaxation that ensues. Be aware of how all your muscles relax in this practice because the relaxation is deepened when it is contrasted with tension. This practice is a boon for those suffering psychosomatic, stress-induced and stress-aggravated disorders like hypertension, diabetes, asthma, insomnia, peptic ulcers and bowel disorders.

**MARMANASTHANAM KRIYA:** The twenty-two sensitive parts of the body are known by the collective Sanskrit term marmanasthanam. To concentrate upon these parts in a particular order or to command these areas to relax in a particular way while concentrating, gives a very satisfactory and deep relaxation that has been found by tested experiments to give relief even to compulsive dreaming. This is an excellent Kriya to do at the end of a strenuous session of asanas and pranayamas. The relaxation should be preceded by at least nine rounds of savitri pranayama, the rhythmic breath, to create the proper atmosphere.

This technique can be done in two ways, one for relaxation the other for deep concentration. For relaxation the technique is done from "feet to the head." For deep concentration from "head to feet." While concentrating upon twenty-two body parts, each part is commanded (by mind) "to relax" or a thought of peace or serenity" directed to the areas.

For relaxation, concentrate upon the (1) toes and command the toes to relax (2) feet (3) lower legs to knees (4) upper legs to hips (5) buttocks (6) base of spine (7) pelvic area (8) abdomen (9) chest and (10) shoulders. Now take your concentration down to the (11) fingers, and

command the fingers to relax then (12) hands (13) lower arms to elbows (14) upper arms to shoulders where your concentration joins with body concentration (15) throat (neck) (16) around the mouth and chin (17) around the nose and cheeks (18) eyes (19) back around the ears (20) back of the head (21) top of the head (22) cavernous plexus in the middle of the forehead. All the while you should command “relaxation.”

Perform jyoti dharana and dhyana (concentration and meditation on the divine light) at the bhrumadhya bindu (midpoint between the eyebrows). Visualize the divine jyoti to be having the brilliance equal to 1000 suns but without the glare. Absorb yourself into this divine jyoti.

### **PRANAYAMA PRACTICES**

**PRANAVA PRANAYAMA:** ‘*Tasya vachakah pranavah*’, the sacred sound of the divine is the pranava says Maharishi Patanjali. This develops abdominal, thoracic and clavicular regions of the lungs to their maximum capacity. Pranava pranayama has unlimited healing potential and is useful in virtually all disorders. It brings about harmony of body, emotions and mind and is an important part of Rishiculture ashtanga yoga tradition as taught by Yogamaharishi Dr Swami Gitananda Giri Guru Maharaj.



Adham pranayama, the abdominal or lower chest breathing. Put the fingers into the Chin Mudra with the index and thumb fingers touching each other at the tips. Keep the other fingers straight and united. Take a deep breath into the lower chest and abdominal regions..1..2..3..4. Now let out the breath with the sound aaa.....

To perform thoracic or mid-chest breathing, the madhyam pranayama, curl your fingers inward to form chinmaya mudra. Take a deep breath into the mid chest and thoracic regions 1...2...3...4. Now breathe out with the sound ooo.....



Adyam pranayama is the clavicular or upper chest breathing and utilizes adhi mudra. Clench your fists with your thumb in the centre. Keep the adhi mudra on your thighs and breathe deeply into upper chest and clavicular regions and then exhale with the sound mmm.....



Joining the earlier three parts of the breath in a complete yogic breath is the fourth stage, known mahat yoga pranayama. Put the adhi mudra with knuckles of your right and left hands touching in front of the navel. This is now known as the Brahma Mudra. Take a deep breath into the low 1...2...mid 3...4...and upper chest 5....6....regions. Now let the breath out with the sounds of aaa...ooo...mmm....



Relax and enjoy the feeling of potent healing energy flow through the entire body.

**NASARGA MUKHA BHASTRIKA:** Nasarga mukha bhasrika is a forceful expulsion of the breath through the mouth that can accompany different movements to relieve our pent up stress. Take up a comfortable standing position and then start to shake your hands as vigorously as possible to help loosen the accumulated tensions of your daily life. Visualize all the tensions that have accumulated in your wrist and elbow joints getting a good 'shake up' by this action.

When you have got the tensions loosened up, take in a deep breath through your nose and clench your fist as if catching hold of all your tensions and stress. Now with a powerful blast through your mouth "whoosh" away all your accumulated tensions and stress as forcibly as possible. Again shake your hands as fast as possible.

Breathe in and catch hold of the tension in your fist. Throw it all away with a blast. Make sure that you are using your diaphragm muscle vigorously while blasting out the breath in this practice.

Perform this practice 3, 6 or 9 times as necessary. After performing 3 to 9 rounds of this practice, relax in the standing position and enjoy the feeling of relief that sweeps through your arms as you relax with some deep breathing.

**CHANDRA PRANAYAMA:** Sit in vajrasana and perform nasarga mudra with your right hand. Close your right nostril with your thumb. Inhale slowly through your left nostril for a count of four. Now exhale through the same left nostril for a count of eight.

Keep your right nostril closed throughout the duration of the practice.



Repeat the chandra pranayama for a minimum of nine rounds at each session. Patients of anxiety, hypertension, insomnia and other stressful conditions can benefit by practising this Pranayama 27 times before breakfast, lunch, dinner and before going to bed at night.

**BHRAMARI PRANAYAMA:** Sit on the heels in the vajrasana with the spine erect. Perform shanmukhi mudra with the thumbs of the hands closing the external auditory canal. The first two fingers are then placed over the closed eyelids while the ring fingers regulate the flow of air through the nostrils. The little fingers are placed over the closed lips. This mudra helps join together nerve energies of hands with facial and trigeminal nerves on the face.



Take a slow and deep breath in for six counts. Let out the breath very slowly while making a sound in the nasal passages like the high-pitched sound of a female bee. This buzzing sound is very much like the anuswarah sound of “mmm” of the pranava AUM. Repeat this at least nine times. Bhamari is one of the swara pranayamas that stimulates and tones up nerve centres. This helps relieve pitta conditions and rejuvenates the skin. It also creates a beautiful voice. It is a contemplative prelude to nada yoga.

### **CONTEMPLATIVE PRACTICES**

**PRANA DHARANA OR BREATH AWARENESS:** Sit in vajrasana or lie down in shavasana. Begin to be aware of your breathing and how the air passes down from the nostrils into the lungs and then back out the nostrils. Feel the abdominal movements as the abdomen rises with the in breath and falls with the out breath. Let your awareness settle in the abdomen. Feel the cool inspired air flowing into the nostrils and the warm expired air flowing out of the nostrils. Let your awareness settle at the tip of the nose. Consciously regulate the breath so that the ratio of inspiration: expiration is equal. It can be a 4, 6, 8 or 10 count. Perform nine rounds of this practice.

**MINDFULNESS BASED MEDITATION:** One of the most productive of the many forms of “quiet sitting”, popularly grouped under the heading of meditation is the mindfulness based awareness of one’s thoughts. This is to be done without identifying with the thoughts and without either justifying or condemning them. Take up a straight back sitting position and sit facing to the North or East in the early morning. Keep your mind as placid as possible, as this is the important feature of the early morning meditation. Breathe slowly and rhythmically, but very quietly. Do not upset the peace. Hold your mind concentrated inside your head at a point in line with the eyebrows. Relax. Don’t attempt to force visualization, simply be alert and expectant. Presently, you will have the sensation of movement within the head, as though watching a “ticker tape” of your thoughts. The thoughts will be in extreme slow motion. Observe the thoughts. Don’t get emotionally involved with them, just watch them. You will actually be able to see your thoughts, as well as hear them. Usually, the thoughts are quite mundane, but benign. Simply observe them passively and dispassionately.

**OM JAPA:** Take up any meditative posture and start to perform the savitri pranayama in a 6 by 3 or 8 by 4 rhythm. Make an audible pranava OM in the bindu nadi. With japa-ajapa, make silent intonation of the pranava OM, concentrating at this same point. Do not let the mind waver away from either a conscious repetition of the mantra OM, as Japa, or as the silent ajapa.

**AJAPA JAPA:** Take up any meditative posture and start to perform the savitri pranayama in a 6 by 3 or 8 by 4 rhythm. As you breathe in listen to the sound of SAH made as the breath enters your respiratory passages. As you breathe out listen to the sound of HUM that is made as the breath leaves your respiratory passages. Concentrate on this ajapa japa of HAMSA SOHAM in tune with the breath.



## **EFFECT OF YOGA ON OXIDATIVE STRESS AND INFLAMMATION IN TYPE 2 DIABETES**

Dr PRABHA ADHIKARI MD<sup>1</sup> and Dr SHREELAXMI V HEGDE PhD<sup>2</sup>

Oxidative stress has been implicated as the root cause underlying the development of insulin resistance,  $\beta$ -cell dysfunction, diabetes, and its associated clinical conditions like atherosclerosis, microvascular complications, and neuropathy.

Inflammation plays a crucial intermediary role in the pathogenesis of diabetes. OST mediated alterations of cytokine expression of IL-6 lead to inflammatory responses. Repeated hyperglycemia due to insulin resistance aggravates the OST and cytokine mediated inflammatory response which further worsens beta cell dysfunction.

Yoga has been found to be beneficial in reducing oxidative stress in type 2 diabetes, but there is a lack of controlled trials to demonstrate the same.

We conducted a study on the effect of 3 month practice of yogasanas and pranayama on 123 type 2 diabetes patients who were stratified for complications such as microvascular, macrovascular, neuropathy and no complications and allocated 60 to yoga group and 63 to control group.

Three months yoga training included tadasana, padahasthasana, vrikshasana, trikonasana, parshvothanasana, vajrasana, vakrasana, gomukasana, paschimotasana, uttanapadasana, pawanamuktasana, bhujangasana, shalabasana, dhanurasana, viparitakarani, sitkari and bhamari pranayama, anuloma viloma, and shavasana poses.

In comparison with the control group yoga intervention resulted in significant reduction in BMI (-0.5 and 0.3 kg/m<sup>2</sup>), FPG (-0.8 and 0.4 mmol/L), HbA<sub>1c</sub> (-0.1 and 0.3%), MDA (-10.8 and 1.3  $\mu$ mol/L) and Increase in GSH (0.8 and -0.8  $\mu$ mol/gmHb) ( $p < 0.001$ ). Significant reduction in PPPG (-1.1 and 0.3 mmol/L,  $p < 0.03$ ) and improvement in vitamin C (7.9 and -6.2  $\mu$ mol/L,  $p < 0.002$ ) was observed in yoga group.

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There was significant improvement in number of proportion of people who tested positive for CRP in the yoga group as compared to control. There was no difference in waist circumference, WHR, BP, vitamin E and SOD in yoga group at follow up.

Our study is limited by the fact that the allocation to the groups was not randomized. Random allocation in community settings is difficult. In this study, social and environmental factors during these training sessions may have a beneficial influence on oxidative stress.

The strength of our study was the stratification of sample according to complications. Participants with various complications may have increased oxidative stress; stratification made the two groups identical.

In conclusion, yoga can be used as an effective therapy in reducing oxidative stress in type 2 diabetes. Yoga is also beneficial in improving glycaemic parameters and BMI and can be administered as an add-on therapy to standard lifestyle interventions.

Yoga was not beneficial in reducing the blood pressure or waist circumference in this short-term study. Further studies are needed to confirm that yoga is beneficial in preventing the progression of diabetes and its complications.

**EFFECT OF YOGA THERAPY ON REACTION TIME, BIOCHEMICAL  
PARAMETERS AND WELLNESS SCORE OF PERI AND POST  
MENOPAUSAL DIABETIC PATIENTS**

Dr MADANMOHAN<sup>1</sup>, Dr ISHWAR V BASAVARADDI<sup>2</sup>, Dr ANANDA BALAYOGI  
BHAVANANI<sup>3</sup>, Dr ZEENA SANJAY<sup>4</sup>, G DAYANIDY<sup>5</sup>

**INTRODUCTION:**

The role of yoga in promoting health and preventing and managing psychosomatic disorders has been established by numerous scientific studies. Yogic techniques produce consistent physiological changes and have sound scientific basis. Yogic lifestyle modification produces remarkable improvements and can make an appreciable contribution to primary prevention as well as management of lifestyle diseases. Yogic practices may aid in the prevention and management of diabetes mellitus (DM) and reduce cardiovascular complications in the population. Reduced ovarian function after menopause results in adverse changes in glucose and insulin metabolism with derangement of lipoprotein profile that is associated with increased risk of cardiovascular disease. The present study was undertaken to evaluate the effect of yoga therapy on reaction time, biochemical parameters and wellness score of peri and post menopausal diabetic patients.

**MATERIALS AND METHODS:**

15 peri and post menopausal patients receiving standard medical treatment for type 2 DM were recruited and reaction time and biochemical investigations were done before and after a comprehensive yoga therapy programme comprising of three times a week sessions for 6 weeks.

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<sup>5</sup> *Yoga Instructor, ACYTER, JIPMER, Puducherry-605006.*

A post intervention, retrospective wellness questionnaire compiled by ACYTER was used to evaluate the comparative feelings of the patients after the therapy programme.

#### RESULTS:

Yoga training reduced auditory reaction time (ART) from right as well as left hand, the decrease being statistically significant ( $p < 0.05$ ) for ART from the right hand. There was a significant ( $p < 0.01$ ) decrease in fasting and postprandial blood glucose levels as well as low density lipoprotein. The decrease in total cholesterol, triglycerides, and very low density lipoprotein and increase in high density lipoprotein was also statistically significant ( $p < 0.05$ ). All the lipid ratios showed desirable improvement with a decrease ( $p < 0.01$ ) of TC/HDL and LDL/HDL ratios and increase ( $p < 0.05$ ) in the HDL/LDL ratio.

#### DISCUSSION:

Shortening of RT implies an improvement in the information processing and reflexes and is the first such report in diabetic patients. This has clinical significance and is worth further exploration with wider, well controlled, randomized studies in the diabetic population. Changes in blood glucose levels may be due to improved insulin sensitivity, decline in insulin resistance and increased sensitivity of the pancreatic  $\beta$  cells to glucose signals. Yoga improved the 'heart friendly' status of lipid profile in our subjects and as our participants were peri and post menopausal, the decrease in cardiovascular risk profile is of greater significance as loss of ovarian function results in adverse changes in glucose and insulin metabolism with derangement of lipid profile associated with increased risk of cardiovascular disease. The main strength of our study is the excellent compliance and regularity of the yoga practice by the patients both during the directly supervised sessions (99.63% attendance) and at home, where all except one patient practiced regularly for an average of 4 days/week and 30-40 min per day. Hence the all-round benefits obtained can be attributed to their dedicated and regular practice. It is concluded that a comprehensive yoga therapy programme has the potential to enhance the beneficial effects of standard medical management of diabetes mellitus and can be used as an effective complementary or integrative therapy programme.

## **TEACHING YOGA TO SENIOR CITIZENS**

Yogachemmal MEENA RAMANATHAN MSc (Yoga)

I have been fortunate and privileged to have opportunities to conduct yoga classes for senior citizens through Pondicherry University Community College and ACYTER, JIPMER. Teaching various yogic techniques to them has always been an unique experience. I have always respected as well as wondered at their sense of commitment, dedication and enthusiasm in learning this grand art/science. Their determination and sense of timing has often left me speechless and flabbergasted.

As one grows older, the transformation back into the childhood begins. They are sometimes self-centered and childish, craving to gain attention. They love to be praised and pampered (who doesn't for that matter?). Feeling sad, worried or bored may be more common for older people who are facing retirement or coping with the death of a spouse, relative or friend. Adapting to these changes leaves them feeling lonely. They carry a notion that they are of no use anymore to the family or the society and hence start feeling inferior and depressed. Their mobility, range of movement, flexibility and the ability to turn (I used to call it turnability- a standard joke in the senior citizen class) is less than before. The physical stiffness radiates to their mind too. Hence, before starting the practice sessions for them, it is essential to talk to them on a personal basis and counseling is the first and foremost step before starting the yogic curriculum. We need to understand their health conditions thoroughly before deciding on the practices that could be given so that they gain the maximum benefit.

Yoga is commonly understood as a practice that is physically beneficial, whereas it is concerned and related more with the mind than the body. Any sign of disease manifested in the body is a result of a mental imbalance or an unhealthy attitude. Promoting healthy lifestyles of elderly people is vital in helping them maintain good health and lead happy and independent lives. In general, our life-span has increased and we live longer than we used to. But as we grow older, we typically become more susceptible to ailments that are linked to

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*Co-ordinator Yoga Centre at MGMC & RI and Outreach Programmes of Yoganjali Natyalayam, Puducherry.*

aging and as a result, we tend to move less. The less we move, the more susceptible we become to a variety of ailments, and so it becomes a truly vicious cycle. Yoga has been proven to help alleviate or reduce many of these health challenges, making it an increasingly popular choice for the adult population. The many benefits of yoga may slow down or even reverse the aging process.

According to Maharishi Patanjali, diseases are merely gross symptoms which accompany the disturbances of mind called vikshepas, that appear as dukha (misery or pain), daurmanasya (dejection), angamejayatva (tremors), and shvasaprashvasa, (disturbances in breathing). Through yoga one can control these disturbances before they become powerful enough to cause breakdown. Bhagavad Gita defines yoga as equanimity at all levels which may also be taken as the perfect state of health where there is physical homeostasis and mental equanimity giving rise to a healthy harmony between the body and mind. Hatha Yoga Pradipika, states that “yoga improves the health of all alike and wards off diseases of one who tirelessly practices yoga whether they are young, old, decrepit, diseased or weak, provided they stick to the rules and regulations properly”. Swami Gitananda Giri Guru Maharaj states, "yoga is the science and art of right-useness of body, emotions and mind". Ammaji, Yogacharini Kalaimamani Meenakshi Devi Bhavanani, says that the regular, repeated, rhythmic practice of yoga helps ward off mental fatigue, thereby ensuing better physiological functioning.

## **PRACTICAL ASPECTS TAUGHT TO THE SENIOR CITIZEN**

The seniors need to be motivated, encouraged and praised for their efforts and improvement in the postures. Creating a supportive environment will make them practice regularly for both the health benefits and the psychological perks. Any form of group activity is mood-elevating for them. They enjoy the yoga sessions immensely and are more comfortable in their group, which they have got so beautifully adapted to. The contact group, the cooperative and closely knit relationship amongst them, provides a sense of belonging driving their loneliness away.

Yogic practices improve various motor skills. The jathis and kriyas improve flexibility. Asanas are non-strenuous, non-fatiguing and can be performed comfortably even during old age. Many times, they may not be able to achieve the final posture, but that hardly matters.

Their effort in trying to achieve the pose, by itself, helps them gain the benefit. Otherwise some variations of the pose which may be easier and less strenuous may be performed. Have to be aware of the ability level of each participant, due to which, there may be a necessity, to reduce the length of time for which an asana is held. Older participants may not have the strength required to hold the pose for a longer period of time but gradually they gain strength from practicing regularly. The pose can be repeated, if desired.

***Never make them perform complicated poses, but always include at least one pose that is a bit more challenging, which boosts up their confidence levels to a great extent.***

As we age, we stop breathing fully. Controlled breathing in pranayama reminds us that it is important to exhale as fully as we inhale. Focusing on deeper and slower inhalations and exhalations slows down physiological functions. Yoga practices open energy channels, harmonize functions of the body-mind and increase awareness. Brahmamudra in which body movement, breath and sound vibrations are synchronized, induces a sense of relaxation and reinvigorates head and neck regions. ***Seniors always enjoy pranayama practice wherein exhalations are accompanied with the sound (nada). They feel their frustrations and irritations evaporate with such practices.***

Yogic relaxation techniques like spanda-nishpanda, kayakriya and marmanasthanam kriya in shavasana help rejuvenate the body-mind complex and create a sense of awareness and relaxation. Directing attention to different parts of the body channelizes energy to those parts.

## **BENEFITS OF YOGA SESSIONS**

1. All participants express improvements in mood, emotional stability and attitude.
2. Elderly persons are often plagued with difficulty in falling asleep and staying asleep. Yoga improves quantity and quality of sleep.
3. Other main benefit is a decrease in their blood sugar levels and normalization of their blood pressure.
4. Their sense of adaptability and adjusting ability improves tremendously helping them gel easily into the groove and into their group.

5. Seniors who needed escorts to take them around are able to move around freely, independently increasing their confidence and self-esteem. This makes them feel very good after all these years.
6. They have a lot of pent-up emotions, which they have repressed over a period of time. They are now able to overcome these because of the practices, giving them a sense of happiness and well-being.

Old age can be made not only bearable but also pleasurable. After all, old age is not a matter of years, but a condition of mind and yoga brings a healthy state of mind. Yoga aims at enabling the individual to attain and maintain the “sukha-sthanam”, which enables one to achieve a sense of physical, mental and spiritual wellbeing. Yoga not only adds a few years to life but also *adds life* to those years. Therefore, practice of yoga, which is tremendously beneficial to seniors, should become an integral part of old age.

#### **CONCLUSION:**

It is true that authentic research is essential for yoga to be accepted by the masses. However, there are certain aspects which are beyond mere recordings, data collection and objective evidence. The mutual experiences of a group of practitioners in a class - be it young energetic students, senior citizens or special children - cannot be recorded by any instrument or apparatus. Strong interpersonal bonding and mutual confidence and silent communications enjoyed are something that has to be experienced and no explanation or data can explain that. The interactivity is soulful. It is poetic. No references to quote and no literary evidences to mention. Is anything more needed to achieve a sense of well being when there is a complete integration of the body (physical practices), mind /emotions (pranayama and relaxation) and soul (personal interactivity)? Isn't this the state of bliss we wish and aim to accomplish? What more proof is needed to substantiate and verify the benefits of this traditional, ancient practice called yoga, passed on to us all the way down through the generations?



## STATISTICAL METHODS FOR MEDICAL/ YOGA RESEARCH

Dr. H.K.LAKSHMAN RAO PhD

It was indeed a pleasure to attend the workshop at JIPMER and interact with participants on the vital role and importance of statistical methods in yoga research. The workshop was a great event and the presentations were very useful, educative and an eye opener. Statistical methods help measure and understand situations accurately and quantitatively. Statistical methods seek to collect and collate meaningful and representative data, analyze adopting methods to get facts from figures using correlation, regression techniques and to validate the hypothesis by adopting tests such as t, Chi square, ANOVA, randomized blocks and Latin squares. It also helps in making appropriate estimation of the variables, measuring cause and effects, trends, projections at given levels of significance/ confidence.

Statistical methods are necessary and vital part of any scientific investigation. With computer software support, any volume of data can be easily analyzed with some statistical knowledge and interpretation skills. Research findings can then be meaningfully presented for future verification of replicated data. For a fast growing science, statistical tools and techniques are vital for generalization and universal applications.

There has been a common tendency among researchers to simply extrapolate observations from small samples, not even based on probability /randomization to the entire population. What appears to be significant/not significant at the sample level may not be so at the universal level. Also analysis and results are based mostly on presentations and graphical indications. Researchers are often saddled with several programs and issues regarding statistical methods and they seldom seek clarifications from statisticians but choose go ahead with high degree of compromise /risks in research methodology.

Following are some of the questions / doubts raised by researchers:

1. What should be the ideal sample size?
2. How to take samples when population exhibits heterogeneity?
3. When exactly statisticians have to be consulted?

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4. How to measure the normality of the distribution?
5. What is the significance of standard error and degree of freedom?
6. What are Type- I and Type II errors? How and when to minimize them.
7. How to control sampling and non- sampling errors?
8. What are point and interval estimates?
9. Under what conditions t, F, Z and Chi- square tests have to be adopted?
10. When are non- parametric tests ideal in research?
11. How normal distribution can be used for estimating the population parameters?
12. How to measure risks and their extent?
13. How to present a medical report statistically?
14. What is a probability sampling? Will it enhance the accuracy?
15. When and why to segment the population?
16. How to choose the level of confidence?
17. How to read statistical tables for interpretations?
18. What is six- sigma and how is it useful in medical administration?
19. How to use built-in software packages?

Any research study/ project carried out without confining to statistical process of data collection and analysis/ interpretation ceases to be scientific. Research must not be undertaken based on sample less than minimum number and with loosely stated hypothesis. It is vital to understand the above basics of statistical methods and or techniques to confidently carry out research in medical system and yoga systems.

The science of statistics is based on samples to measure such as averages, variations and comparisons. Statistical sampling is different from the sample that we usually understand and adopt. Statistical methods need to be adopted in full and not in parts to seek the truth / reality about the population. We have to proceed from the known (sample) to the unknown (population/ Universe). We must proceed in a careful and methodical manner otherwise we will be misled to illusions and wrong conclusions. The purpose of statistical methods is to minimize errors in our judgment/ generalizations so that the research findings can be adopted with confidence. Appropriate research methodology is therefore needed in order to spread the message of yoga for wellness and such methodical approaches are essential.

## **RESULTS OF A SURVEY OF PARTICIPANT FEEDBACK AT ACYTER**

Dr MADANMOHAN<sup>1</sup>, Dr ANANDA BALAYOGI BHAVANANI<sup>2</sup>, Dr ZEENA SANJAY<sup>3</sup>, G DAYANIDY<sup>4</sup>, L VITHIYALAKSHMI<sup>5</sup>, E JAYASETTIASEELON<sup>6</sup>

The Advanced Centre for Yoga Therapy Education and Research (ACYTER), a collaborative venture between JIPMER, Puducherry and Morarji Desai National Institute of Yoga (MDNIY), New Delhi was established by MOU between JIPMER and MDNIY on 7 June 2008.

This advanced centre is focusing primarily on the role of Yoga in the prevention and management of cardiovascular disorders and diabetes mellitus. Dr Madanmohan, Professor and Head, Department of Physiology, JIPMER is the Programme Director.

Yoga therapy OPD is functioning in Super Specialty Block of JIPMER. Yoga therapy and lifestyle consultation is given daily by Dr Ananda Balayogi Bhavanani, Programme coordinator and Dr Zeena Sanjay, SRF while group and individual Yoga therapy sessions for diabetes, cardiovascular diseases and other conditions are being conducted every day by the Yoga instructors Sri G Dayanidy and Selvi L Vithiyalakshmi in the ACYTER Yoga Hall situated in 3rd floor of Institute Block.

In the period from March to June 2011, a survey was done on 100 patients who were regularly attending Yoga therapy sessions at ACYTER and had completed a minimum of one month of the regular programme.

A questionnaire was given to them consisting of questions related to their age, gender and demographic characteristic in addition to their main health complaints, attendance at the

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Yoga sessions, home practice as well as their physical and mental condition and changes in dosage of medication.

Results of the survey are given in number of participants except for those questions where all 100 participants had not replied, in which case % values are reported instead.

- **AGE:** Age of the participants ranged from 16 to 77 years with an average age of  $47.04 \pm 4.85$  years (SEM). The maximum participants (39) were in the age group of 40-60 y while 25 were above 60 and 24 in the age group 30-40. There were 11 in the age group 20-30 and 2 were below 20 y ears of age.
- **GENDER:** 49 participants were male and 51 female.
- **DEMOGRAPHIC DATA:** 91 of the participants were from Pondicherry town and surrounding rural areas while 9 were from adjoining areas of Tamil Nadu.
- **MAIN HEALTH COMPLAINTS:** The system wise break up of main health complaints listed by the participants was: diabetes mellitus (41), hypertension and other cardiovascular disorders (39), musculoskeletal disorders (13), respiratory disorders (13), endocrine (12), neurological disorders (5), gastro intestinal disorders (3), obstetrics and gynecological disorders (3), dermatological disorders (1) psychiatric disorders (1) and others (11). Some of the participants had multiple complaints.
- **REGULARITY OF ATTENDANCE AT ACYTER:** 50 had attended yoga therapy sessions for 1-3 months, 26 for 3-6 months, 16 for 6-12 months and 8 for more than a year. 60 participants were attending the sessions 3 days/week, 21 of them 4 days/week while 8 were attending once/week, 7 twice /week, 2 five days/week and 2 six days/week. The regularity was attributed to a feeling of physical and mental betterment (58%), regularity of the sessions (23%) and symptomatic relief (12%). Inability to be more regular was attributed by the participants to work pressure and examinations (7%).
- **REGULARITY OF HOME PRACTICE:** 21 were practising at home on 3 days/week, 18 on 2 days, 11 on 5 days, 10 on all 7 days, 10 on 4 days, 9 on 6 days and 3 were practising at home only once/week. 14 reported that they were not practicing at home

at all. The regularity of home practice was attributed by the participants to a feeling of physical and mental betterment (49%) while inability to be more regular was attributed to lack of time (18%), work and education (18%), laziness (9%) and other home circumstances (6%). 46% of the participants reported a home practice of 30 min, 17% for 40 min, 16% for 20 min, 15% for 60 min and 6% reported that they practised for more than an hour at home. This regularity was attributed to a feeling of wellbeing (47%) while the irregularity was attributed to lack of time (29%), work pressure (18%) and other factors (6%).

- **HEALTH STATUS:** 56 participants reported that their health status was better than when they started the yoga practice. 36 reported that it was much better than before while 7 said that it was the same as before. One participant reported total relief from his health complaints after starting the yoga programme.
- **DOSAGE OF MEDICATION:** 56 participants reported no change in their medication, 29 reported a decrease while 2 reported an increase in the dosage of their medication. 13 of the participants were not on any medication.
- **GENERAL SUGGESTIONS:** The majority of participants reported satisfaction with the programme as well as the teaching methods of the instructors. General suggestions included the need for more space for practice sessions, an increase in the number of sessions as well as duration of sessions and possibility of sessions being conducted after office hours. The participants thanked the Director JIPMER and MDNIY for starting ACYTER thus enabling so many persons to benefit from the excellent yoga programmes conducted free of cost.

### **POST INTERVENTION, RETROSPECTIVE WELLNESS QUESTIONNAIRE**

A post intervention, retrospective wellness questionnaire compiled by ACYTER was used to evaluate the comparative feelings of the patients after the therapy programme.

Five different responses ranging from 'worse than before' to "complete relief / total satisfaction' were utilized to evaluate various physical and psychological aspects of the patient's condition.

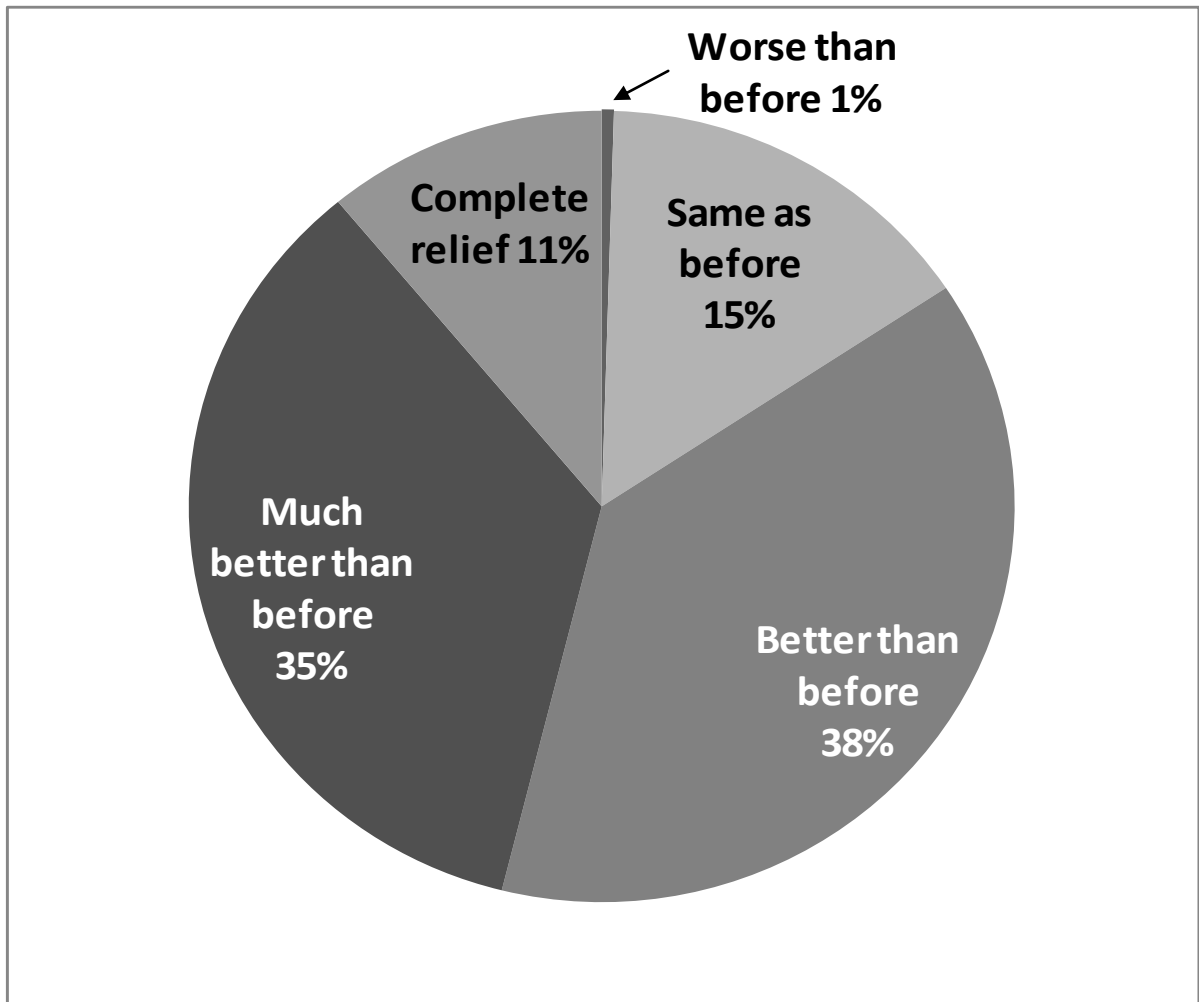
**Table 1: Responses of the participants to the retrospective wellness questionnaire**

	<b>Worse than before</b>	<b>Same as before</b>	<b>Better than before</b>	<b>Much better than before</b>	<b>Complete relief / Totally satisfied</b>
Ability to concentrate	-	12%	56%	30%	2%
Control of anger / loss of temper	-	15%	51%	26%	8%
Appetite	1%	26%	37%	24%	12%
Confidence level	2%	12%	41%	37%	8%
Ease of breathing	-	14%	33%	41%	12%
Energy levels	-	18%	39%	39%	4%
Enjoyment of life	-	18%	41%	28%	13%
Feeling calm & fresh	-	14%	32%	40%	14%
Feeling of hopelessness	1%	19%	36%	30%	14%
Feeling of loneliness	1%	15%	40%	30%	14%
General flexibility	-	11%	37%	42%	10%
General mood	-	7%	38%	47%	8%
General sense of relaxation	-	12%	37%	43%	8%
General wellbeing	-	10%	36%	39%	15%
Joint mobility	-	12%	36%	41%	11%
Nervousness	-	14%	45%	34%	7%
Normality of menstrual cycles	4	29%	21%	25%	21%
Pain levels	-	14	41%	30%	15%
Performance of day-to-day activities	-	12%	41%	38%	9%
Sleep quality / duration	1	19%	26%	39%	15%
Stress levels	-	17%	38%	33%	12%
<b>Total wellbeing score</b>	<b>0.48%</b>	<b>15.24%</b>	<b>38.19%</b>	<b>35.05%</b>	<b>11.05%</b>

The questionnaire was finalized in consultation with a 12 member team consisting of 3 eminent medical practitioners, 2 psychologists, 2 yoga experts, 2 eminent yoga therapy consultants, 2 educationalists and one legal anthropologist.

The post intervention overall wellness scores of the participants are given below in Fig.1 and the detailed breakup of % responses to each question is given above in Table.1.

Results of the retrospective wellness scores indicates that 11% attained complete relief from their condition while 35% felt much better than before. 38 % were better than before while 15% had no change in their condition. The condition of 1% was worse than before.



**Fig 1: Post intervention total well being score of participants**



யோக சிகிச்சை கல்வி மற்றும் ஆராய்ச்சிக்கான முதுநிலை மையம்

योग चिकित्सा शिक्षा एवं अनुसंधान उन्नत केन्द्र

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



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

### INTRODUCTION TO ACYTER

The Advanced Centre for Yoga Therapy Education and Research (ACYTER), a collaborative venture between JIPMER, Puducherry and Morarji Desai National Institute of Yoga (MDNIY), New Delhi was established by MOU between JIPMER and MDNIY on 7 June 2008. This advanced centre will focus primarily on the role of yoga in the prevention and management of cardiovascular disorders and diabetes mellitus. Dr Madanmohan, Professor and Head, Department of Physiology, JIPMER is the Programme Director.

### AIMS & OBJECTIVES

- To bridge the gap between yoga and modern medicine
- To introduce yoga in medical curriculum and facilitate an awareness of the therapeutic potential of yoga amongst the medical professionals
- To provide quality yoga and lifestyle consultation and standardized yoga therapy to patients of JIPMER
- To conduct collaborative research projects with MDNIY
- To conduct seminars, workshops, symposia and conferences
- To standardize yoga techniques and procedures
- To conduct yoga classes for JIPMER staff, students and general public
- To create an awareness about the art and science of yoga amongst the people of Pondicherry and surrounding regions

### SERVICES OFFERED THROUGH ACYTER

Yoga therapy OPD is functioning in Super Specialty Block of JIPMER. Yoga therapy and lifestyle consultation is given by Dr Ananda Balayogi Bhavanani, Programme co-ordinator and Dr Zeena Sanjay, SRF from 9.30 AM to 1 PM every day.

Group and individual Yoga therapy sessions for diabetes, cardiovascular diseases and other conditions are being conducted every day from 10 AM to 1 PM and 3 to 4.30 PM in the ACYTER Yoga Hall situated in 3<sup>rd</sup> floor of institute block.



A senior citizen clinic is being conducted every Thursday from 11 AM to 12 noon and Mrs. Meena Ramanathan, Guest faculty is conducting the special sessions that have been well appreciated by the senior citizens of Pondicherry.

Regular yoga classes are being conducted from 6.30 to 7.30 AM and 4.30 to 5.30 PM on Monday, Wednesday and Friday at the ACYTER Yoga Hall situated in 3<sup>rd</sup> floor of institute block. The Yoga Instructors, Sri G Dayanidy and Selvi L Vithiyalakshmi are conducting the classes for JIPMER staff, students and their family members on a regular basis.

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 Rajajeyakumar, SR, Department of Physiology.

### **ACTIVITIES OF ACYTER**

ACYTER has been active in conducting Yoga training for medical students, organizing a mass awareness programme in 48 schools of Puducherry and organized a National Workshop on “Introducing Yoga in Medical Curriculum” in March 2009. Regular academic programmes are being held every Saturday and three foreign delegations from Australia and New Zealand, Belgium and Germany have visited ACYTER and participated in the activities during 2009.

Yoga awareness programmes have been conducted for staff and students of the Government Dental College and for participants of the Nursing Workshops on AIDS at the JIPMER Nursing College. ACYTER also conducted yoga and healthy lifestyle consultations for the delegates attending the Regional Official Language Conference for South and South Western Zone at JIPMER in October 2009 and the 17 International Yoga Festival conducted by Department of Tourism, Government of Pondicherry in January 2010.

ACYTER organized a workshop on Chakra Meditation for Healing by Sri Balaratnam, founder Vibrational Breath Therapy Melbourne, Australia on 1 January 2010. Dr Madanmohan, Programme Director, Dr Ananda Balayogi Bhavanani, Programme Co-ordinator and staff members ACYTER participated actively in the 17 International Yoga Festival conducted by Tourism Department, Government of Puducherry at Sri Subulakshmi Mahal from 4-7 January, 2010.

ACYTER also participated in the Workshop on “Stress Management and Personality Development through Yoga” conducted by Anandita Trust, New Delhi in January 2010 at Pondicherry. ACYTER conducted a Workshop-cum-Seminar on Yoga and Complementary Therapies for HIV/AIDS in collaboration with Pondicherry AIDS Control Society (PACS) on 30 January, 2010.

Programme Director and, Programme Co-ordinator were invited speakers for the National Yoga Week 2010 organized by MDNIY at New Delhi from February 12 to 18. Programme Director chaired a session on “Yoga for Cardiovascular Health” while Programme Co-ordinator conducted a workshop on “Yoga for Technostress” in collaboration with staff of MDNIY. Shri E Jayasettiaseelon, SRF and Shri G Dayanidy, yoga instructor participated in the conference, seminar and workshop organized during the week long programme at MDNIY.

Programme Co-ordinator presented an invited talk on “Yoga: A boon for maternal and child health” at Mother Theresa Institute for Health Science as part of the State Level Campaign for mother and child health organized by the Directorate of Indian Systems of Medicine and Homeopathy, Government of Pondicherry on 23 February 2010. All the participants and eminent experts of modern medicine and alternative medicine who were present on the occasion appreciated the presentation that highlighted the importance of yoga in both antenatal and postal natal care.

Special classes on yoga for antenatal and postnatal health were conducted on 23 and 24 February for students of final year B.Sc Nursing at the JIPMER Nursing College. The classes were conducted by Selvi Vithiyalakshmi, yoga instructor while Programme Co-ordinator gave a theory session highlighting important yoga practices for both antenatal and postal natal care. More than 50 students participated in the classes enthusiastically.

Programme Co-ordinator presented invited talks on “Bridging yoga and modern medicine” and “Yoga research-where are we?” during the Seminar on Yoga for Doctors organized and conducted at Kaivalyadhama, Lonavla, Maharashtra on 26 and 27 February 2010.

ACYTER and Department of Physiology, JIPMER organized a two day National Workshop-cum-Seminar on “Role of Yoga in Prevention and Management of Hypertension” on 18 and 19 March 2010 at JIPMER. The workshop was organized in collaboration with Morarji Desai National Institute of Yoga (MDNIY), New Delhi, an autonomous organization under the Department of AYUSH, Ministry of Health and Family Welfare, Govt. of India. The workshop was inaugurated by Dr KSVK Subba Rao, Director JIPMER and Dr AK Das, Medical Superintendent, JIPMER was guest of honour. Senior faculty members from various departments of JIPMER as well as eminent yoga and medical experts from all over the country participated in the inaugural function.

The workshop deliberated on the role of yoga in the prevention and management of hypertension with keynote lectures, invited talks, lecture-demonstrations, panel discussions and practice sessions that were given by a team of 27 resource persons from JIPMER, DIPAS, Krishnamacharya Yoga Mandiram, Iyengar Yogashraya, Sikkim, Kaivalyadhama and the International Centre for Yoga Education and Research (ICYER). Nearly 200 participants including medical, paramedical & yoga professionals from all over the country attended the workshop along with 100 first year medical students of JIPMER.

One month Foundation Course in yoga for Medical and Paramedical Professionals and Students was conducted at JIPMER from 18 October to 20 November 2010. 63 medical doctors, paramedical professionals, students and staff members of JIPMER participated in the training programme. The theory lectures were conducted in Bernard Theatre and practice sessions in the auditorium of the Nursing College under the direction of Dr. Madanmohan, Professor and Head, Department of Physiology, JIPMER and Programme Director ACYTER.

Dr Ananda Balayogi, Programme Coordinator ACYTER was invited to present a lecture on “Yoga for women” in the 8<sup>th</sup> National Conference hosted by Puducherry Chapter of Society of Midwives on 13 November 2010. He was invited to present another lecture on “Principles & Practice of Yoga Therapy for Geriatric Psychiatric Disorders” in the one day workshop on “Yoga Therapy for Psychiatric Disorders” held at the Advanced Centre for Yoga, NIMHANS, Bangalore on 5 December 2010. The event was organized jointly by the Advanced Centre and Morarji Desai National Institute of Yoga, New Delhi.

A delegation of yoga teachers from Italy visited ACYTER on 11<sup>th</sup> December and expressed their admiration for the programme and its activities. They were especially appreciative that Indian Government was bringing Yoga into the mainstream health care system through advanced centers at JIPMER, NIMHANS, DIPAS, Gujarat Ayurveda University & at Government Medical College, Jammu.

Staff of ACYTER also participated in the 18<sup>th</sup> International Yoga Festival Conducted by the Government of Pondicherry from 4-7 January 2011. Invited talks were given by Dr Ananda Balayogi, Programme Coordinator ACYTER and free consultation on yoga and healthy living was provided to 102 delegates and members of the public in the ACYTER stall. Sri G Dayanidy, Yoga Instructor ACYTER won first place in the 25-35 age category and was selected to participate in the Final Championship Round.

Staff of ACYTER presented talks and lecture demonstrations during the CME on Physiological Effects of Yoga, organized by Department of Physiology, Sri Satya Sai Medical College and Research Institute, near Chennai on January 17, 2011. Dr Madanmohan, Programme Director presented an overview of “Yoga and Physiology” while Dr Ananda Balayogi, Programme Coordinator gave a talk on “Therapeutic Potential of Yoga”. Dr Zeena Sanjay gave a talk on “Yoga research” that also highlighted the activities of ACYTER, while Sri G Dayanidy gave a spectacular demonstration of various Yoga Asanas with commentary by Dr Ananda. The CME was attended by more than a hundred members of the management, faculty, staff and students who gave positive feedback and expressed appreciation for the entire programme.

Dr Madanmohan, Programme Director and Dr Ananda Balayogi, Programme Coordinator were invited to give invited talks and workshops during the Golden Jubilee National Seminar cum Workshop cum on “Role of Yoga in Respiratory Tract Disorders” on January 20-21, 2011. The event was organized by Advanced Centre for Yoga Education and Research, Gujarat Ayurved University, Jamnagar and MDNIY.

Dr Madanmohan, Programme Director and Dr Ananda Balayogi, Programme Coordinator and Dr Zeena Sanjay attended National Yoga Week 2011 conducted at MDNIY. Dr Madanmohan chaired an academic session and addressed the valedictory function while Dr Ananda gave an invited talk on “Yoga for general well being”.

ACYTER conducted National workshop – cum seminar on Role of yoga in prevention & management of diabetes mellitus, organized at JIPMER on March 1&2, 2011. Proceedings of the “National workshop cum seminar on role of yoga in prevention and management of hypertension” and Tamil booklets on “Yogic Management of Diabetes Mellitus”, “Yogic Management of Cardiovascular Disorders” and “Normal healthy diet” were released.

ACYTER is conducting specialized yoga therapy sessions for pregnant ladies on Tuesdays / Thursdays at ACYTER as part of a pre-eclampsia prevention clinical trial 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).

As part of the introduction of yoga to medical professionals, the Programme Director and staff of ACYTER conducted pranayam classes for senior and junior residents and research scholars of Physiology department. 20 participants attended the classes held in May and June 2011.

The ACYTER Yoga Research Lab was inaugurated on July 6<sup>th</sup> 2011 by Dr. KSVK Subba Rao, Director, JIPMER in the Super Specialty Block. Dr. AK Das, Medical Superintendent and Dr. Balachander, Professor and Head, Dept. of Cardiology were special invitees. Patients are being referred from the Yoga OPD and Shri E Jayasettiaseelon, SRF is monitoring pre and post recordings of health parameters as part of various pilot projects and case studies. Patients are given advice on lifestyle modification based on their anthropometry, biochemical and psychological health profile parameters. Baseline HRV is being recorded for all patients attending the Yoga OPD with special emphasis on diabetes and cardiovascular disorders. Recordings have been completed for 171 patients till date.

Free Hypertension screening and Yoga consultation Programme was conducted in Lawspet, Pondicherry on August 6<sup>th</sup> 2011. More than 150 members of the general public attended the programme organized by the residents and PhD scholars of the Department of Physiology and staff members of ACYTER in coordination with the local MLA.

The Programme Co-ordinator was invited Guest Speaker at CME on Obesity organized by Woman Doctors Association (TN) at Sri Lakshminarayanan Institute of Medical Studies, Pondicherry on August 7 2011 and presented interactive talk on “Dealing with obesity the Yoga way”. Mr. G Dayanidy, Yoga Instructor gave an excellent yoga demonstration.

During August and September 2011 Sri G Dayanidy and Selvi L Vithiyalakshmi, Yoga instructors of ACYTER gave yoga theory and practical sessions for 40 students of physiotherapy at Mother Theresa Institute of Health Sciences, Pondicherry. This was organized as part of the ACYTER yoga education programme for paramedical professionals and students.

Dr Ananda Balayogi Bhavanani, Programme Coordinator ACYTER was invited to present a lecture on “Yoga and Education” on December 21 during the 19<sup>th</sup> International Yoga conference at SVYASA, Bangalore.

Staff of ACYTER conducted a special Yoga Awareness programme for more than 50 corporate executives and invitees of the Harmony Company at Hotel Athiti on January 21 2012.

Dr Madanmohan, Programme Director presented an Invited talk on “My work in yoga” on February 4 at Golden Jubilee Celebrations of Kashmir Medicos Association and CME, New Delhi. He also presented an Invited talk on February 10 on “Integrating naturopathy and yoga in conventional medical education” and chaired a session in the International Conference on Yoga, Naturopathy and AROGYA Expo – 2012, Bangalore.

Dr Madanmohan, Programme Director and Dr Ananda Balayogi Bhavanani, Programme Coordinator presented Key Note addresses and chaired scientific sessions during National Yoga Week from February 12-18 at MDNIY, New Delhi. Poster presentation of ACYTER activities was exhibited by Sri E Jayasettiaseelon, SRF and Miss L Vithiyalakshmi.

## **RESEARCH WORKS**

Many research projects are being conducted at JIPMER as collaborative efforts between ACYTER and the Departments of Physiology, Medicine, Biochemistry, Cardiology and Obstetrics & Gynecology. Papers and abstracts have been published and also submitted for publication. Details of various studies completed / in progress are given below:

**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.
2. Effect of yoga therapy on cardiac autonomic function in patients of essential hypertension – a randomized controlled study.

**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 cardiorespiratory functions of normal young volunteers
2. Effect of yoga therapy on reaction time, biochemical parameters and wellness score of peri and post menopausal diabetic patients.
3. Effect of yoga training on heart rate, blood pressure and lipid profile of patients with essential hypertension.
4. Effect of yogic training on physical and biochemical variables of type 2 diabetes mellitus patients.

**OTHER RESEARCH PROJECTS:**

**Completed:** Patient feedback survey and retrospective wellness questionnaire was completed for 100 patients in June 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 pre-eclampsia in high risk women.

**PILOT STUDIES:****Completed:**

1. Immediate effect of sukha pranayama on heart rate and blood pressure of patients with hypertension.
2. Immediate cardiovascular effects of kaya kriya in normal healthy volunteers.
3. Immediate effect of shavasana and savitri pranayama on heart rate and blood pressure of hypertensive patients.
4. Immediate effect of chandra nadi pranayama on heart rate and blood pressure of hypertensive patients.
5. Immediate cardiovascular effects of shavasana and pranava pranayama on heart rate and blood pressure of hypertensive patients.
6. Immediate effects of yoga nidra on heart rate and blood pressure.
7. Immediate effect of suryanadi and chandranadi on short term heart rate variability in healthy volunteers.
8. Immediate cardiovascular effects of pranava pranayama in hypertensive patients.
9. Immediate effect of yoga practices on blood pressure.
10. Immediate effect of suryanadi pranayam on heart rate and blood pressure of hypertensive patients.

**In Progress:**

1. Acute effect of anulom vilom pranayam on heart rate variability in healthy volunteers.
2. Immediate effect of 5 minutes chandranadi pranayam on heart rate variability in hypertensive patients.
3. Immediate effect of 5 minutes chandranadi pranayam on heart rate variability in Diabetes mellitus patients.
4. Acute effect of 5 minutes chandranadi pranayam on heart rate variability in patients with diabetes mellitus and hypertension.
5. Immediate effect of 5 minutes chandranadi pranayam on heart rate variability in patients of heart failure.
6. Effect of respiratory rate on heart rate variability in healthy volunteers.
7. Effect of yoganidra on short term HRV in heart failure patients.
8. Acute biochemical and physiological effects of unilateral and bilateral nostril breathing in patients of diabetes.
9. A controlled trial of immediate effects of pranava pranayama in shavasana on patients having both diabetes and hypertension.

**CASE STUDIES (completed):**

1. Effect of yoga on subclinical hypothyroidism.
2. Effect of yoga in newly diagnosed hypertension.
3. Effect of yoga in a patient of long standing diabetes and hypertension.

4. Case report on COAD in an adult.
5. Case report on bronchial asthma in a 4 year old child.

## **PUBLICATIONS**

### **Published papers:**

1. Effect of yoga therapy on reaction time, biochemical parameters and wellness score of peri and post menopausal diabetic patients. Madanmohan, Ananda Balayogi Bhavanani, Dayanidy G, Zeena Sanjay, Basavaraddi IV. International J Yoga 2012; 5: 10-15.
2. Immediate effect of sukha pranayama on cardiovascular variables in patients of hypertension. Ananda Balayogi Bhavanani, Zeena Sanjay, Madanmohan. International J Yoga Therapy 2011; 21: 4-7.
3. Don't put yoga in a small box: the challenges of scientifically studying yoga. Ananda Balayogi Bhavanani. International J of Yoga Therapy 2011; 21 ; 21.
4. A comparative study of slow and fast suryanamaskar on physiological functions. Ananda Balayogi Bhavanani, Kaviraja Udupa, Madanmohan, Ravindra PN. International J Yoga 2011; 4: 72-77.
5. Effect of yoga on subclinical hypothyroidism: a case report. Ananda Balayogi Bhavanani, Zeena Sanjay, Madanmohan. Yoga Mimamsa 2011; 43: 102-107.
6. Yogic perspective on depression and mental health. Ananda Balayogi Bhavanani. Yoga Mimamsa 2011; 43: 254-264.
7. Results of a survey of participant feedback at ACYTER, JIPMER Pondicherry. Madanmohan, Ananda Balayogi Bhavanani, Zeena Sanjay, G Dayanidy, L Vithiyalakshmi, E Jayasettiseelon. Yoga Life 2011; 42 (Nov): 11-13.
8. Are we practicing yoga therapy or yogopathy? Ananda Balayogi Bhavanani. Yoga Therapy Today 2011; 7 (2): 26-28
9. Introducing yoga to medical students: the JIPMER experience. Madanmohan. Yoga Vijnana 2008; 2: 71- 78.

### **Published abstracts**

1. Role of yoga in prevention and management of cardiovascular disease: the JIPMER experience. (Published invited talk) Madanmohan. Souvenir & Abstract. 24<sup>th</sup> Annual Conference, Indian Society for Atherosclerosis Research & International CME on Atherosclerosis 2011, p 7-10.
2. Immediate effect of suryanadi and chandranadi on short term heart rate variability in healthy volunteers. Rajajeyakumar M, Madanmohan, Amudharaj D, Bandi Harikrishna, Jeyasettiseloune, Bhavanani AB Indian J Physiol Pharmacol 2011; 55 (5 supplement): 43-44.
3. Yoga and the educational process. Ananda Balayogi Bhavanani. Souvenir 19<sup>th</sup> International Conference on Yoga. SVYASA, Bengaluru. December 2011. p 122.

## Papers in press

1. Role of yoga in managing bronchitis. Ananda Balayogi Bhavanani and Zeena Sanjay (Journal of Alternative and Complementary Medicine).
2. Immediate effect of chandra nadi pranayama (left unilateral forced nostril breathing) on cardiovascular parameters in hypertensive patients. Ananda Balayogi Bhavanani, Madanmohan, Zeena Sanjay (International Journal of Yoga).
3. Yoga is not an intervention, but maybe yogopathy is. AB Bhavanani (Int Jof Yoga).
4. Immediate cardiovascular effects of pranava pranayama in hypertensive patients. Ananda Balayogi Bhavanani, Madanmohan, Zeena Sanjay, Basavaraddi IV (Indian Journal of Physiology and Pharmacology).
5. Immediate effect of mukha bhastrika (a bellows type of pranayama) on reaction time in special children. AB Bhavanani, Meena Ramanathan, Harichandrakumar KT (IJPP)
6. Effects of a comprehensive eight week yoga therapy programme on cardiovascular health in patients of essential hypertension. Madanmohan, AB Bhavanani, Zeena Sanjay, Vithiyalakshmi L, Dayanidy G (Indian Journal of Traditional Knowledge).
7. Immediate cardiovascular effects of pranava relaxation in patients of hypertension and diabetes. Ananda Balayogi Bhavanani, Madanmohan, Zeena Sanjay, Vithiyalakshmi L (National Medical Journal of India)

## ATTENDANCE AT YOGA OPD AND PRACTICE SESSIONS

Yoga therapy OPD is functioning in the Super Specialty Block of JIPMER daily from 9 AM to 1 PM and yoga therapy sessions are being conducted at ACYTER yoga hall for diabetes everyday from 10 – 11 AM, for cardiovascular diseases from 11 AM – 12 noon on Mondays, Wednesdays and Fridays and from 12 noon – 1 PM everyday for other disorders. Sessions are conducted individually and in groups as per requirements of the patients and directions of therapists. Yoga classes for normal subjects are being conducted on Mondays, Wednesdays and Fridays at 6.30 AM and 4.30 PM and for senior citizens on Thursdays between 11 AM and 12 noon.

### 2009

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Grand total
<b>OPD attendance</b>						92	116	95	112	183	97	91	786
<b>Therapy sessions</b>													
• <b>Diabetes</b>						77	150	176	137	166	141	72	919
• <b>Hypertension</b>						35	100	116	79	105	77	43	555
• <b>Other disorders</b>						70	77	117	134	157	151	97	803
<b>Senior citizens</b>						41	57	30	30	18	8	38	222
<b>Normal subjects</b>						16	29	23	9	14	16	50	157
<b>Total</b>						<b>331</b>	<b>529</b>	<b>557</b>	<b>501</b>	<b>643</b>	<b>490</b>	<b>391</b>	<b>3442</b>



## 2010

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Grand total
OPD attendance	82	77	68	71	87	96	109	112	62	85	74	75	998
Therapy sessions													
• Diabetes	47	116	108	73	53	68	113	171	133	192	159	242	1475
• Hypertension	29	49	57	43	34	52	75	101	117	110	82	128	877
• Other disorders	58	162	142	133	155	148	204	150	135	213	162	216	1878
Senior citizens	17	38	35	29	17	19	42	35	39	36	32	44	383
Normal subjects	73	57	41	44	36	77	134	88	119	59	35	70	833
<b>Total</b>	<b>306</b>	<b>499</b>	<b>451</b>	<b>393</b>	<b>382</b>	<b>460</b>	<b>677</b>	<b>657</b>	<b>605</b>	<b>695</b>	<b>544</b>	<b>775</b>	<b>6444</b>

## 2011

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Grand total
OPD attendance	214	74	148	81	118	110	104	190	113	111	150	93	1506
Therapy sessions													
• Diabetes	224	258	265	246	300	232	236	167	251	148	143	146	2616
• Hypertension	120	118	186	186	176	151	133	199	182	134	146	158	1889
• Other disorders	186	232	352	245	243	254	269	181	185	163	147	148	2605
Senior citizens	21	29	45	28	45	53	40	49	49	16	25	50	450
Normal subjects	146	150	119	98	142	92	140	105	392	541	425	192	2542
<b>Total</b>	<b>911</b>	<b>861</b>	<b>1115</b>	<b>884</b>	<b>1024</b>	<b>892</b>	<b>922</b>	<b>891</b>	<b>1172</b>	<b>1113</b>	<b>1036</b>	<b>787</b>	<b>11608</b>



**யோக சிகிச்சை கல்வி மற்றும்**  
**ஆராய்ச்சிக்கான முதுநிலை மையம்**  
**योग चिकित्सा शिक्षा एवं अनुसंधान उन्नत केन्द्र**



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

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

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