SleepWatching India

Indian Society for Sleep Research (ISSR) Newsletter, Issue: 2, 01/11/2015

Message from President ISSR

Dear Readers,

India is a vast country with diverse climate and culture. The population is crossing 1.25 billion.

Sleep is the biggest luxury provided by the nature with enormous unknown benefits. The consequences of not sleeping well and on time are scientifically well documented.

But the modern society has started abusing it by staying awake more and disturbing normal physiology. We have to bring the importance of sleep and sleep disorders to general public to build a healthy India.

The expertise needed for promoting sleep health of the nation is enormous. But we are a handful to cater to the needs of the country. We have to attract more students and doctors to pursue sleep medicine as a career to fill the vacuum. This issue of *SleepWatching India* highlights the contribution of different sleep research laboratories as well as sleep centres in the country. Our editor, Dr Tripat has done a marvellous job by collecting and compiling information from various sources to bring this issue. I wish more clinical sleep centres would have responded to help us in assessing the national scenario in sleep medicine. I am sure, the readers will be definitely benefitted from this exercise of ISSR.

We have also started a Board review corner covering Indian Board of Sleep Medicine (IBSM) exam pattern questions on Sleep technology and Sleep Medicine in this issue. ISSR is thankful to Dr. Deepak Srivastava for agreeing to contribute to this section on a regular basis.

I wish you all a bright and prosperous Happy Dipawali.

Dr. Hrudananda Mallick, MD, PhD

From the Editor's Desk

In 2006 I had no idea of other Sleep labs in India and the work being done by them. In my search I found it difficult to obtain this consolidated information at any one place.

Many years later even in 2015, I found it difficult to find enough information to guide beginners interested in the field of Sleep Medicine to approach sleep labs in their region for training, and also to increase their awareness on the work being done across different Sleep labs in India.

With this in view I set out to gather as much information as I could about the work done in various Sleep labs across India, and in the past year I have compiled the information sent from different Sleep labs and this is being presented to you in this issue of "Sleep Watching India"

There are more than 300 Sleep labs in India. I have tried to gather information from the labs whose correspondence address was available. Not all the Sleep labs responded to my request but many responded. The Sleep labs from the following states responded to my request- Delhi, Uttarakhand, Rajasthan, Maharashtra, Karnataka, Kerala, Tamil Nadu and Assam, and I have consolidated the information provided by them in this issue. In many of the other states, I was not able to obtain the correspondence address. It would be welcome if our readers could provide me with addresses of other functioning sleep labs.

I have tried to cover the following aspects regarding Sleep labs- details of team members, clinical services offered, a summary of past and ongoing research work, training opportunities in each lab and contact details of the Head of each lab.

The experience that any trainee acquires from the Sleep labs summarized in this issue should be sufficient to make the candidate eligible for appearing for either a national or international level certification exams in the field of Sleep Medicine and Sleep technology.

I do admit that there may be other sleep labs not covered in this issue of which I am not aware, whose training might make their candidates eligible for different national and international level certification exams in the field of Sleep Medicine and Sleep technology.

This issue of the newsletter contains 60 pages of consolidated information. It may be felt by many that this is too much information for a single issue of the newsletter. However I felt that it is better not to delay dissemination of this basic information from reaching those interested in a career in Sleep Medicine as I am constantly receiving queries for information from interested candidates.

My grateful thanks to all the Sleep labs that have agreed to provide the requested information, as it marks the beginning of information sharing and guidance for our young medical graduates. I request those Sleep labs not covered in this issue to share their details with ISSR, which can be published in the forthcoming issues of this newsletter. You can email us at sleepwatching@yahoo.com.sg

I hope the audience finds this information useful. I look forward to receiving your valuable feedback and inputs so as to make the latest information available to you.
Your feedback is invaluable.

Regards.
Dr. Tripat Deep Singh

ISSR Activities

2012	2013	2014	2015
World Sleep Federation (WSF) Exam 15 July 2012 Written exam No. of Applicants=7	**WSF Exam** 15 July 2013 Online Exam No. of Applicants=5	**WSF Exam** 13 July 2014 Online exam No. Of Applicants=3	**WSF Exam** 26 July 2015 Online Exam No. Of Applicants=5
National Sleep Medicine Course 13-15 Dec 2012 Bangalore	**National Sleep Medicine Course** 13-15 Dec 2013 Chennai	**Asian Sleep Research Society (ASRS) Conference** 22-24 Sep 2014 Kovalam, Kerala, India	**National Sleep Medicine Course** 5-6 Dec 2015 Guwahati, Assam India
No. of Participants=100	No. of Participants=100	No. of Participants=300	
Faculty from USA, Japan, India and Singapore	Faculty from USA, Japan, India and Singapore		
Ist National Sleep Technology Course 13 Dec 2012 Bangalore, India	**2nd National Sleep Technology Course** 13 Dec 2013 Chennai, India	**3rd National Sleep Technology Course** 26-27 Sep 2014 Delhi, India	**4th National Sleep Technology Course** 9-10 Dec 2015 AIIMS Delhi, India
No. of Participants=30	No. of Participants= 60	No. of Participants= 44	
Faculty from USA, India and Singapore	Faculty from USA and India	Faculty from USA, India and Singapore	
		Workshop on Sleep Medicine at APICON 19 Nov 2014 Puri, Orissa, India	**'Importance of Sleep in School Children' Program**
		No. of Participants=70	
		Instituted **Budur Krishna Murthy Young Investigator and Travel award**	**Started Newsletter and Literature Updates**

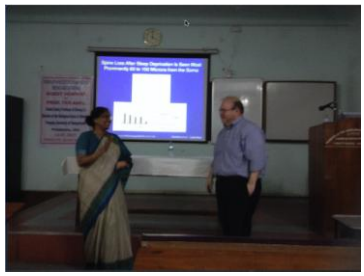
For more details on each activity please visit www.issr.in

Doctors Certified by World Sleep Federation in India through ISSR

2012	2013	2014	2015
Dr. Tripat Deep Singh	Dr. Pragati Agrawal	Dr. Apar Jindal	Dr. Sourav Das
Dr. Vikas Mittal	Dr. Pramod Krishnan	Dr. Sujit Jagtap	Dr. Deepak Menon
Dr .Teresa MPC Ferreira	Dr. Haseeb Hasan	Dr. Ghulam Hussain	Dr. Rajanish Sharma
Lt Col Dr Karuna Datta	Dr. Kripesh Sarmah		Dr. Vivekananda Lahan
Dr. Nitika Dang	Dr. Ravi Gupta		Dr. Hardeep Kumar

ISSR in Pictures

ISSR sponsored Guest Lecture By Prof. Ted Abel at NIMHANS,Bangalore
16 Jan 2015



‘Importance of Sleep in School Children’ in AIIMS, New Delhi on April 8, 2015

We all sleep. We sleep about 1/3 rd of our life. The amount of sleep varies from infancy to old age. There is enough scientific evidence to confirm that sleep is as important as nutrition and exercise for the growth and development of our children. Neglecting right amount of sleep has negative consequences on health. However there is not much awareness about the same amongst parents and peers in India.

We organized a half day symposium on ‘**Importance of Sleep in School Children’** in AIIMS, New Delhi on April 8, 2015 to sensitize teachers on the importance of sleep on the mental and physical health and academic performance of the school children. We invited 2-3 teachers including principal/head from 50 schools of New Delhi.

A panel of internationally reputed sleep scientists addressed the symposium and sleep medicine experts on various sleep related health issues in children. The importance of sleep habits (sleeping on time and getting on time), sleep duration in school growing children, impact of school time on sleep duration and harmful effect of blue lights from i-phone, i-pads, TV etc were discussed.

Sleep research in the Department of Physiology, AIIMS Delhi from inception till date

Dr Hrudananda Mallick after obtaining his MD and PhD from All India Institute of Medical Sciences, New Delhi joined as a faculty in 1990. He started his career in neuroscience under IBRO career development programme for young neuroscientists initiated by Prof Masao Ito in 1987. He worked in prestigious Exploratory Research for Advanced Technology programme of Japan Science and Technology Corporation in Toyama University School of Medicine under Prof Taketoshi Ono. His work on glycine potentiation of glutamate induced neuronal excitability has got US, Canadian and European patent.

Dr Mallick has been working on the role of preoptic area in male sexual behaviour, thermoregulation and sleep-wakefulness with Prof V Mohan Kumar till 2006. He has extended Baldev Singh Sleep laboratory established by Dr Mohan Kumar in the Dept of physiology to human sleep research. This is one of the rare laboratories where both animal and human sleep and chronobiology research are conducted. Dr Mallick along with Dr Deepak Shrivastava from USA is carrying out sleep medicine education programme (National Sleep Medicine Course and Sleep Technology Workshop) in India since 2006. He is currently the President of Indian Society for Sleep Research and the Asian Sleep Research Society.

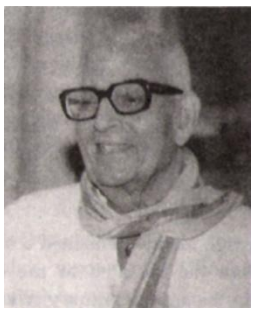
The Sleep research laboratory in the Department of Physiology is an internationally renowned sleep laboratory recognized for its outstanding basic and innovative sleep research. It isnot only the first in the country but also one of the rare laboratories where both animal and human sleep and chronobiology research are conducted.

Since inception of All India Institute of Medical Sciences in 1956, the Department was fortunate to have Professors BK Anand and AS Paintal, the twoundisputable leaders of neurophysiology in the country at that time. Dr Anand as the Head, research in the department mostlycentred around on study of hypothalamic mechanism of feeding behaviour. In 1965 Dr Baldev Singh joined the department of Neurology as professor and started collaborative research in neurophysiology with Dr Anand. After completion of his assignment in Neurology Prof. BaldevSingh joined the department of Physiology as Emeritus Professor, to pursue his research interest. This marked the beginning of sleep research in the department as well as in the country.

At that time, two young researchers T Desiraju and GS Chhina were working with Dr Anand. Baldev Singh and Desiraju had a common interest, i.e. neurophysiology of sleep. They, along with Anand studied the electrical activity of cortical and sub-cortical regions in free-moving cats during sleep. They have also performed low voltage stimulations of sub-cortical regions to induce EEG synchronization. Lesions of the area lateral to the trigeminal nucleus abolished ipsilateral eye movements selectively during the paradoxical phase of sleep and not during the alert state (Desiraju et al, 1966; Desiraju et al, 1967; Singh et al, 1966).

They did split brain studies in cats and monkeys. Baldev Singh had an Indian Council of Medical Research project to study the electrophysiological signals during different stages of sleep in cats, monkeys and human subjects. SarojKesar was working with him for animal experimentation. Electro-sleep in human subjects was another area in which some work was done in the department by Prem Kumar from the army. Dr Anand and Dr BaldevSingh also investigated many renowned yogis during sleep-wake and meditation in the sixties.

In the late 1960s, Mauro Mancia from Milan, joined the department to study sleep physiology in monkeys. Mancia was a disciple of Giuseppe Moruzzi, the co-discoverer of Ascending Reticular Activating System. Their study of sleep-wakefulness cycle in conscious monkeys with split brain-stem showed that desynchronized sleep was almost abolished, and EEG synchronization was strongly reduced, in these monkeys. These studies gave further boost to the research on sleep at AIIMS (Mancia et al, 1967; 1968).
Dr V Mohan Kumar joined the department in December 1968. He was attracted by the scientific work of Desiraju, and personality and attitude of Prof Baldev Singh, which took him to sleep research.



Prof. Baldev Singh

After returning from USA,Desiraju started working independently on single cell activity in conscious monkeys during sleep and wakefulness,and published several single author papers (Desiraju, 1971; Desiraju, 1972a,b; Desiraju, 197a,b,c,d,e).As far as sleep research is concerned, that was a glorious period for the AIIMS, Delhi. Unfortunately Desiraju had to leave the Dept because of hostility as his rise was not digested by others.

Dr Mohan Kumar faced uphill roads in the prime of his career. When he came back from Milan after a post doc his job was given to somebody else. Inspite of departmental politics and deterrents he steered through all obstacles and pursued his research goals in sleep. Joining of Sikdar and Neelam as student during this critical period made all the difference. He had the first scientific publication from India in 1980 with Sikdar. In this paper they showed the changes in ventromedial hypothalamic neurons on stimulation of rostral and caudal brain stem reticular formation. While working in Milan, Dr Mohan Kumar had noticed that low frequency stimulation of caudal brainstem produced EEG synchronisation. It was his earnest desire to map out the areas in the brainstem that can produce EEG synchronisation. He was able to work on it and map out this reticular area in and around the nucleus gigantocellularis. This area can produce EEG synchronisation not only during low frequency stimulation, but also during high frequency stimulation from some of the points within this region (Mohan Kumar et al, 1985).

BN Mallick, Subimal Datta and Abdul Aleem joined the laboratory as PhD students. Mallick worked on preoptic neuronal activity during EEG alterations, and the changes produced in their activity by stimulation of rostral and caudal brain stem reticular formation (Mohan Kumar et al, 1984, Mallick et al, 1984; Mohan Kumar et al, 1985, Mallick et al, 1985; Mohan Kumar et al, 1986, Kumar et al, 1988). Datta worked on changes in sleep-wakefulness on application of adrenergic agonists and antagonists in the preoptic area (Mohan Kumar et al, 1984; Mohan Kumar et al, 1985, Datta et al, 1985; Mohan Kumar et al, 1988, Datta et al, 1988). Aleem was working on midline thalamic neurons, and their responsiveness to brainstem and hypothalamic inputs (Aleem et al, 1986; Mohan Kumar et al, 1987).

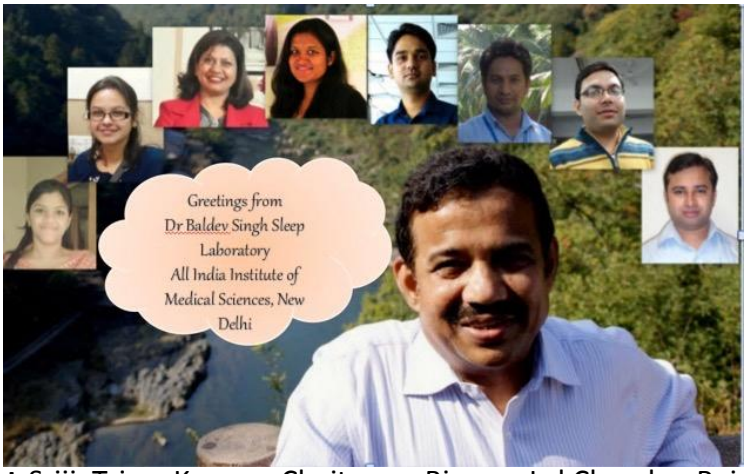
The laboratory shifted focus to the role of preoptic area on sleep. Subimal, Ratna, and Ramesh studied the preoptic area noradrenergic mechanism in sleep. Besides sleep the laboratory was also studying the role of the preoptic area in thermoregulation and sexual behaviour. The first neural transplantation study in the country was done in the laboratory in 1996. Sunita and Joshi John carried out studies to recover sleep after transplantation of fetal tissue in the preoptic area lesioned rat. We carried out for the first time simultaneous electrophysiological recording of sleep and functional magnetic resonance imaging in rats and showed activation of medial preoptic area during sleep (Khubchandani et al 2006. Baishali studied interrelationship between sleep and thermoregulation using telemetric recording of sleep, body temperature and locomotor activity in a specially designed environmental chamber (Ray et al). Dr Mohan Kumar superannuated in 2006. The illustrious students of Dr Mohan Kumar are now world renowned sleep scientists and neuroscientists. To name few are Sujit Sikdar, Subimal Datta, Birendra Nath Mallick, H N Mallick, Joshi John and Thomas Thannikkal.

H N Mallickwas working on the role preoptic area and medial septum integratingsleep-wakefulnesss with male sexual behaviour and thermoregulation.Vetrivelan, Srividyaand Kamalesh joined the Dept. Srividya and Kamalesh worked on the role of septum on sleep and neural mechanism of penile erection during REM sleep.

Mahesh and Deependra worked on role of lateral preoptic area on sleep thermal preference whereas Deependra was working on the role of thermoreceptors linking sleep and temperature. Karuna was instrumental in seating of the human sleep laboratory in 2014 which was the long cherished desire of Dr Mohan Kumar. Presently the laboratory is involved in study of sleep and its functions. The laboratoryis equippedwith fourdigital polysomnography, telemetric recording of sleep and body temperature, conventional electrophysiology for single unit recording, microinjection techniques, molecular imaging, institute neuroimaging set up and human sleep laboratory. Human sleep laboratory will beutilised as training centres for physicians and technicians in polysomnography which is a growing need for the country.

The laboratory had the honour of Dr Mohan Kumar as vice president of World Sleep Federation and President of Asian Sleep Research Society (ASRS) in the past and HN Mallick as present President of ASRS. The laboratory had the honour of organizing theFirst ever InternationalConference on sleep and sleep medicine in the country in 1992 which marked the beginning of modern sleep medicine in India.. It also conducted the Interim Congress of World Federation of Sleep Research and Sleep Medicine Societies in 2005. The laboratory is actively involved in organising sleep medicine courses forphysicians' and technicians for last 10 years with Dr Deepak Shrivastava from UCDavis, USA. The laboratory is also promoting sleep healthamongst school children and general publicthrough lectures and exhibition. It has also participated in National TV Programme to attract young researchers to pursue a career in sleep.

Sleep medicine is a rapidly growing multidiscipline in the country. We dream to raise this small laboratory to a Integrative Sleep Medicine Centre to cater trained technicians and physicians to the country.



Team from Left to Right-Sriji, Trina, Karuna, Chaitanya, Binney, Lal Chandra, Rajeev, Rajesh and me.

For more details please send an email at -drhmallick@yahoo.com

Training opportunities in Dr. Baldev Singh Sleep Lab AIIMS, Delhi

- Polysomnography in animals and human.
- Telemetric recording of sleep and body temperature
- Single neuronal recording in anesthetised and behaving animals
- Stereotaxic techniques, classical electrophysiology, intracerebral microinjection
- Cellular imaging

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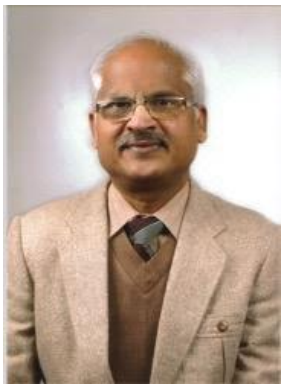
Anti-oxidant therapy in sleep apnea – A view from the fence



Krishnan Ravi is currently serving as Professor and Heads the Department of Physiology at V.P. Chest Institute, University of Delhi, Delhi. He obtained his M.Sc., (Human Physiology) degree from JIPMER, Pondicherry and Ph.D., degree from the Faculty of Medical Sciences, University of Delhi. He is involved in teaching and research in basic and applied physiology for the last four decades. He was a post-doctoral fellow at the University of Alberta, Edmonton, Canada from 1986-1990. He has been a Visiting Scientist at the Division of Cardiology, University of California, Davis, USA on five occasions and has published several research papers, reviews and monographs in reputed national and international journals and written chapters in books.

He is the first one to study the properties of airway rapidly adapting receptors (RARs) and report the existence of the type J receptors in the non-human primate.

He is a leading expert in the area of 'pulmonary vagal sensory receptors'. His findings demonstrate the functional significance of RARs in asthma, left ventricular dysfunction, cigarette smoke inhalation and high altitude pulmonary edema. With Prof. Kappagoda, he has discovered a new reflex namely the "pulmonary renal reflex". His interest in the field "Sleep Apnea" has resulted in contributions, which implicate that anti-oxidant intake, is a useful therapeutic option in patients with obstructive sleep apnea syndrome. He has revised the Section 'Respiration' for Best & Taylor's PHYSIOLOGICAL BASIS OF MEDICAL PRACTICE, 13th Edition.

For a person who is primarily a laboratory scientist, an individual who has four decades of research experience on "Vagal sensory mechanisms in health and disease", developing interest in the field "sleep apnea" was purely accidental. It happened because of a curious but peculiar finding that we observed in the rabbit which showed that mild fluid accumulation in the pulmonary extravascular space resulted in an increase in urine flow and it was abolished by sectioning of the vagi as well as by the renal sympathetic nerves suggesting that the afferent for this reflex resided in the vagi and the efferent in the renal sympathetics. Further experiments demonstrated that this reflex was due to an increase in renal production of nitric oxide (NO) through the stimulation of renal sympathetic nerves. Why these results were peculiar was because the majority of the findings reported that an increase in renal sympathetic nerve activity decreased urine volume and sodium excretion, and an increase in renal NO facilitated water reabsorption in the renal tubules.

To translate our findings from bench to the bed side, I was looking for clinical conditions where there was enhanced sympathetic nerve activity as well as diuresis. On surveying through the literature, I realized that patients with sleep apnea had hypertension, natriuresis and nocturnal polyuria. The urge to urinate was so high among these patients that it resulted in frequent arousals from sleep. I started wondering whether the nocturnal polyuria and natriuresis were due to renal nitric oxide as a result of an increased sympathetic drive! Being a respiratory physiologist, I became curious and thus, "Sleep apnea" became another area of interest to me.

It was at this time that a tall, slim man wearing a turban joined my department to do his MD in Physiology. As is customary, I asked him whether he wanted to work in any particular area for his dissertation. He told me that he had a good working knowledge of yoga and he would like to investigate its beneficial effects on patients with respiratory ailments.

During the course of his conversation, he made a mention that he had some exposure to the sleep laboratory also while he was in Chandigarh. It was the year 2006 and by then, a Sleep Laboratory had started functioning in our Institute. I gave him the wild idea that the nocturnal polyuria in patients with obstructive sleep apnea (OSA) could be due to excessive sympathetic drive leading to an increase in renal NO and the NO was prevented from exerting its anti-diuretic action due to oxidative stress which converted NO to peroxynitrite as a result of the rapid reaction between superoxide and NO. In that case, the natriuresis and polyuria would get corrected by an anti-oxidant intake. This hypothesis was against the findings in the rabbit which demonstrated that increased NO caused diuresis.

The student I was referring to is none other than the editor of this News Letter Dr. Tripat Deep Singh. For this study, we managed to include Dr. V.K. Vijayan, a renowned pulmonologist and our Director too. The working hypothesis was that oxidative stress was an underlying mechanism for the increased sympathetic drive, natriuresis and nocturnal polyuria reported in patients with OSAS. The basis for the hypothesis was simple. In sleep apnea, due to recurrent hypoxia-re-oxygenation cycles, there would be oxidative stress as evidenced during ischemia reperfusion. In fact, there had been several studies which reported that the lipid peroxidation levels were higher and the anti-oxidant status was lower in patients with OSAS. After continuous positive airway pressure (CPAP) treatment, a reduction in the oxidative stress was reported also. Till we got into this field, there was no study which examined whether treatment with anti-oxidants alone had any beneficial effects upon the polysomnography (PSG) measurements and/or improved the sleep quality in patients with OSAS. The details of the selection of the subjects, the study plan and the data collection are mentioned in our publication (Singh et al., 2009, IJCD, 51: 217-224). After confirmation, PSG was performed on 20 male patients with OSAS and CPAP was given for two consecutive nights to every patient. Subsequently, each one of them took vitamin C (100 mg) and vitamin E (400 IU) twice daily orally for 45 days following which a repeat PSG was done. Ten healthy normal subjects served as controls and they underwent all the procedures except the CPAP therapy. It was observed that in OSAS patients alone, there was oxidative stress which was reduced significantly by both CPAP as well as anti-oxidant treatment. After anti-oxidant intake, there was a significant decrease in Epworth sleepiness score and the number of apneic episodes These patients spent more time in stages 3 and 4 of sleep. Also, there was a significant decrease in the optimum pressure of CPAP device. In summary, these findings demonstrated that anti-oxidant intake improved the quality of sleep in these patients.

To determine whether NO played any role in the diuresis and natriuresis reported in OSAS patients, 12-h urine volume in the day and 12-h urine volume in the night were measured and the concentrations of urinary sodium and nitrate were determined in the above patients. The frequency of urination was noted also. Unlike the control subjects, there was no diurnal variation in OSAS patients - the night urine volume and urinary sodium concentration were similar to those during the day. With CPAP therapy, the diurnal variation was restored - the night urine volume as well as the urinary sodium decreased significantly compared to those during the day. Such a reversal was not evident with anti-oxidant treatment. Indeed, the night urine volume which was higher to begin with, increased further. In the control subjects, while no significant difference was seen between the day and night samples with respect to urinary nitrate, there was a significant increase in urinary nitrate in the night sample compared to that in the day sample in OSAS patients. With CPAP therapy, the urinary nitrate level in the night sample became similar to that in the day sample.

However, instead of the reversal, the urinary nitrate in the night sample remained higher after anti-oxidant treatment. The urination frequency which was more became similar to the controls after CPAP as well as anti-oxidant treatment (Singh et al., 2011, IJCD, 53: 11-20). The major conclusions that emerge from this study are: 1) Even though renal NO produced by sympathetic stimulation gets converted to peroxynitrite by the oxidative stress, whatever NO is bioavailable is capable of causing diuresis and natriuresis, 2) A further increase in NO by anti-oxidant intake promotes further diuresis without natriuresis suggesting that they may be independent phenomena, 3) In man also, conditions which favour an increase in renal NO can result in diuresis - supporting our results in the rabbit and

4) the increase in the frequency of urination in these patients is because their sleep is disturbed and not due to an increase in the bladder pressure due to filling of urine.

After Dr. Tripat completed his MD, we continued our studies on OSAS patients using the anti-oxidant N-acetylcysteine (NAC). We confirmed our previous finding that there was oxidative stress in them (n=10). With oral intake of NAC (600 mg thrice daily for 30 days), along with a reduction in oxidative stress, and optimum pressure in CPAP, there was an overall improvement in the quality of sleep with significant decreases in apnea-hypopnea index, apnea related arousals, longest apneic episode duration, number of oxygen desaturation events per hour and Epworth sleepiness score. Additionally, the relative snore time, duration of longest snore episode and even number of snore episodes decreased significantly. Such effects were not seen in OSAS patients of the placebo group (n=10). NAC was found to be effective in reducing the parameters of the metabolic syndrome also. These results reiterate the usefulness of the anti-oxidant treatment in patients with OSAS (Sadasivam et al., 2011, IJCD, 53: 153-162).

In another study performed by us, Dr. Puneet Kumar demonstrated that in patients with OSAS (n=20), oral intake of grape seed extract (300 mg for 5 weeks) not only improved the quality of sleep but also decreased the level of the inflammatory mediator TNF-α (MD dissertation, 2012 submitted to Delhi University, unpublished observation).

To conclude, this fundamental scientist is of the opinion that anti-oxidants are extremely beneficial in alleviating most of the symptoms of sleep apnea. Even though the sample size is small to reach definite conclusions, the results are consistent, statistically significant and reproducible. Through this letter, I make an appeal to all the pulmonary physicians and sleep specialists to take note of these results, improve upon the findings, make a multicentric clinical trial on the therapeutic potential of various anti-oxidants in treating patients with sleep apnea and come out with recommendations.

K. Ravi Ph.D.,
Professor & Head,
Department of Physiology,
V.P. Chest Institute,
University of Delhi,
Delhi - 110007

Sleep Research Lab, Jawahar Lal Nehru University (JNU), Delhi

Dr. Sushil Jha has joined the school of Life Sciences, Jawaharlal Nehru University as Assistant Professor of Neurobiology in January 2007 and he is now working as Associate Professor of Neurobiology. Dr. Jha has also worked with Prof. Adrian Morrison at School of Veterinary Medicine, University of Pennsylvania, USA and their he has contributed in understanding the role of the emotional center “the amygdala” in REM sleep regulation. Dr. Jha has obtained “Faculty-career development award” and “Young Scientist award” while working with Dr. Morrison at UPENN.

Dr. Jha has also worked with Prof. Marcos Frank at School of Medicine, UPENN and has contributed in understanding the role sleep in ocular dominance plasticity.

After returning from USA, Dr. Jha has set up his independent lab at SLS, JNU, where he is investigating the role of sleep in memory consolidation. He is actively involved in the sleep research and has published more than 30 papers in the international journals. He has also presented his work in several international conferences such as the Asian Sleep Research Society, 2015.

Conceivably from the Vedic or post-Vedic period, it is said generation after generation that there are five prominent characteristics of an ideal student. It is said in Sanskrit that

अल्पहारी, गृहत्यागी, काकचेस्ष्टा, बकोध्यानं, श्वन् निद्रा, इदं विद्यर्थि पञ्च लक्क्षणं.

In the above line "Svan Nidra" represents the nature of sleep in a dog. It was believed that the dog has light sleep only as it always remains watchful, so a student should also have similar behavior. It also suggests that an ideal student should not spend more time in sleep. It is virtually a misconception that the dogs' sleep is light in nature. Similar to human sleep, the dog also exhibits different stages of sleep such as Rapid Eye Movement sleep (REM sleep: the deepest stage of sleep) and Non-REM sleep (NREM sleep: also called deep sleep). These two stages of sleep have been found only in birds and mammals. However, dual sleep stages have not been observed in reptiles, amphibians, and fishes. It still remains an enigma that why dual sleep stages have evolved in the higher animals only, such as in birds and mammals? What does the sleeping brain do to our mind and body? We are attempting to address these questions in our laboratory at the School of Life Sciences, Jawaharlal Nehru University, New Delhi.

Human spend a third of their lives sleeping, and most of us think we sleep to restore body and brain metabolic expenditure. This could be true, but we don't actually know why we sleep? If rats are continuously deprived of sleep, they die after 12-14 days. Why do the rats die without sleep? Is it that sleep is indispensable for their survival? On the other hand, humans can sustain their life till eleven days without sleeping and show no immediate visible ill effects apart from feeling sleepy. This obviously does not tell us much about why we sleep, only that we have a very powerful mechanism to make us sleep. But on the other hand, many evidences demonstrate that sleep fulfills multiple functions, and most of them are imperative for our survival.

In our laboratory, we have demonstrated that short-term (6 hrs only) total sleep deprivation soon after training impairs the consolidation of trace and fear-conditioned memories in the rodents. The sleep-deprived animals (sleep deprivation performed soon after training for only 6 hrs) demonstrated skill deficit in obtaining fruit juice during testing compared to non-sleep deprived and stress control animals. Also, short-term (6 hrs) total sleep deprivation soon after training-induced learning deficit in fear conditioning. The sleep-deprived animals exhibited significantly less fear responses during testing compared to non-sleep deprived and stress control animals. These suggest that sleep, after learning of a task, plays an important role in memory consolidation. At the same time, our studies also suggest that a few hours of sleep deprivation soon after experiencing a traumatic event may be beneficial in removing the negative emotional memories of the events and hence would minimize the chance for the development of panic disorders in those subjects. Further, we have shown that each sleep stage possibly contributes differently to the learning processes. For example, we have observed that NREM sleep plays an important role in the consolidation of fear conditioned memories while REM sleep plays an important role in non-fear conditioned memories in the rat. In addition, we have demonstrated that sleep plays an important role in a dynamic rearrangement of neuronal circuitries underlying ocular dominance plasticity in the visual cortex in the cat.

Sleep also plays an important role in the modulation of several physiological functions. For example, heart rate and blood pressure decrease during NREM sleep but increase during REM sleep. During NREM sleep, pulmonary ventilation is diminished (as a result blood pH may also decrease), which otherwise remains elevated during wakefulness and REM sleep. The respiratory groups of neurons in the brainstem perceive the elevated hydrogen ion concentration through chemosensors and in turn accelerate pulmonary ventilation to help protect neural damage from an altered blood pH.

Therefore, to help maintain physiological range of blood CO_2, it seems obligatory that the subject should periodically go from NREM sleep to a high ventilation state, which occurs during either wakefulness or REM sleep. We have recently proposed that since frequent arousal from sleep may not be physiologically and cognitively sensible, therefore, intermittent REM sleep between NREM sleep would thus be favored to help maintain optimum CO_2 level and long-lasting sleep periods.

Our team members (from left to right):
Front row: Shweta, Munazah, Deepika, Priyanka, Shweta II, Anjali.
Back row: Ramesh, Fayaz, Sushil, Shekhar, Tankesh.

The reptiles may not require REM sleep as they are intermittent breathers, and that is why REM sleep might have evolved in higher animals only such as the mammals and birds.

Although REM sleep is present in almost all the terrestrial mammals, but it is absent in aquatic mammals. The aquatic mammals are obligate swimmers and have to surface at regular intervals for breathing. Also, these animals live in thermally challenging environments, where the conductive heat loss is approximately ninety times greater than air. Therefore, they have to be mobile most of the time. As an adaptation, they have evolved unihemispheric sleep, during which they can move as well as take rest. The activity of the postural muscles and the temperature regulating machinery remain suspended during REM sleep. Therefore, REM sleep is not at all suitable for the aquatic mammals, and thus nature has possibly eliminated its expression in these mammals. Interestingly, using the disk-over water, multiple or single platform, and wire-mesh grid platform methods, in which, water is used as the surrounding medium, REM sleep can completely be abolished even in terrestrial mammals. Our laboratory has recently proposed that aquatic conditions, as well as gravity, inhibit the expression of REM sleep, and that is why REM sleep might be absent in the aquatic mammals. However, it remains to be investigated that if REM sleep is also altered in the crew members on a ship in the deep sea.

Training Opportunities In Sleep Research Lab, Jawarhar lal Nehru University (JNU), Delhi

Our laboratory offers training at the masters, Ph.D. and post-doctoral levels to understand the basic neurobiology of sleep, learning and memory and cognition for short term (3-4 months) or long term (one year and beyond). The training program is specially designed to enhance the number of trained personal in our country in the field of neurobiological and neurobehavioral research related to basic and applied research on sleep and learning and memory. The enrolment in the Ph.D. program is exclusively through the entrance test followed by interview. The students having junior research fellowship (USC, CSIR, ICMR etc) may apply directly (no need to turn up in the entrance examination conducted by JNU) but selection is made through interview board (for detail see our web site: https://admissions.jnu.ac.in/). The interested master and post-doctoral trainee may directly approach to laboratory director Dr. Sushil K. Jha through e-mail: sushilkjha@mail.jnu.ac.in or meet personally in the Room # 208, School of Life Sciences, Jawaharlal Nehru University, New Delhi-110067. (Also see our web site http://www.jnu.ac.in/FacultyStaff/ShowProfile.asp?SendUserName=sushilkjha).

Sushil Kumar Jha, Ph.D
School of Life Sciences
Jawaharlal Nehru University
New Delhi -110067, India.
E-mail : sushil_1000@yahoo.com;sushilkjha@mail.jnu.ac.in

The Human Sleep Research Laboratory, Department of Neurophysiology, NIMHANS, Bangalore

Dr. Bindu M. Kutty, M.Phil, Ph.D (Neurophysiology), Currently working as Professor of Neurophysiology, NIMHANS , Bangalore . Got more than twenty years of research and teaching experience in the field of Neurophysiology. One of her major research areas of interest is to understand the brain functions from sleeping brain perspectives. Her research team focus on understanding the dysfunctional thalamocortical mechanisms during sleep as a window to understand the ptahophysiology of schizophrenia , Anxiety disorders , cerebellar ataxia , Parkinson's disease etc. In addition, the team focus on the neurophysiological correlates of Vipassana meditation from both waking and sleeping brain perspectives.

She has established a state of art human sleep research laboratory in the department . Additionally , her team is also working with animal models to understand the role of sleep in memory functions .

She is currently the General Secretary of ISSR. She actively participates in the National Sleep Medicine Course (NSMC) as teaching faculty. She is committed to propagate sleep education and conducts CMEs regularly in medical colleges in Karnataka state, India

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The Human Sleep Research Laboratory, Department of Neurophysiology, NIMHANS, Bangalore has been established in the year 2000 with a vision of undertaking sleep research: to understand the neurophysiology of sleep in health and disease; towards manpower development in the area of sleep research; to provide short term and long term training in the area of human sleep; to establish academia-industry collaborations to develop software as well as hardware for polysomnography studies, analysis of sleep EEG, etc.

So far we have completed three Govt. funded research projects on polysomnography , completed 4 Ph.D, 2M.Phil Dissertations and 2 MD Theses in Psychiatry. Currently 1 Ph.D , 2 M.Phil dissertations and 2 D.M. dissertations and one Govt. Funded projects are ongoing . More than 5 students trainees from different universities have completed their short term projects towards B.Tech , M.Tech Degrees, and more than 25 students have undergone short term training as a part of M.D. Physiology curriculum by the RajivGandhi University for Health Sciences, Bangalore and also from other states .

We are pioneers in undertaking polysomnographic studies to elucidate the neural correlates of Vipassana meditation from sleeping brain perspective. As it is known that meditative practices condition brain functions at different levels and in different ways, we have undertaken many comprehensive studies to elucidate the influence of Vipassana meditation on sleep organization in the past 15 years. We have demonstrated the distinct changes brought by meditation practices on the macro and micro sleep architecture, how meditation proficiency helps in defying age associated changes in sleep, how meditative practices modulate autonomic functions during sleep to preserve the sympathovagal balance, etc. Currently, we are looking into the influence of meditation proficiency on sleep organization, the electrophysiological correlates of consciousness during sleep associated with meditation,etc.

Our research lends credibility to the proposition that meditative practices are useful tools for bringing about neuroplasticity changes leading to enhanced cognitive reserve capacities. Our ongoing research explores the science of lucid dreaming in proficient meditators as well as induction protocols in healthy controls. Prof. Sunao Uchida, Director Sports Sciences Waseda University collaborates with the meditation studies. Other collaborators include Dr. RavindraPanth , Director, NavanalandaMahavihara University, Patna in the sleep, meditation and consciousness program.

We have undertaken a few collaborative research projects to elucidate the pathophysiology of neuropsychiatricdisorders from sleeping brain perspective and also to look at the possible biomarkers. We have completed two projects on Generalized Anxiety Disorders (GAD) and on Schizophrenia and currently undertaken studies with Spino-Cerebellar Ataxia and Parkinson's disease. Sleep disturbances are common features of GAD and Schizophrenia and we have demonstrated the efficacy of traditional ayurvedic formulations (*ManasamitraVatakam*) in establishing sleep quality as well as in preserving the sleep architecture in patients with GAD and co morbid social phobia . We have also showed that *ManasamitraVatakam*is much more effective in preserving quality sleep than clonazepam treatment though both are potent anxiolytics. We have also demonstrated the abnormalities of sleep cycle dynamics and spindle delta dynamics in patients with recent onset schizophrenia as a window to understand the dysfunctional thalamocortical mechanisms associated with schizophrenia pathophysiology. At present we are looking at the various aspects of macro as well as the micro sleep architecture abnormalities in Spino-Cerebellar Ataxia and Parkinson's Disease as a means to understand how sleep abnormalities could predict the severity of neurodegeneration and disease progression. These studies are undertaken in collaboration with the department of Psychiatry and Neurology, NIMHANS, especially with Dr. C.R. Chandrasekhar (Professor of Psychiatry), Dr. John P. John (Professor of Psychiatry), Dr. Pramod K. Pal (Professor of Neurology) and Dr. Ravi Yadav (Additional Professor of Neurology). We have planned several more collaborative studies with Institutions other than NIMHANS as per the 12th Five year plan.

In addition, our group has been using suitable animal models for looking into the role of sleep in memory consolidation especially the hippocampal theta activity, thalamocortical functions, cholinergic mechanisms, etc. associated with memory consolidation during sleep, how ventral subicular lesion affects sleep and cognitive functions etc. These are taken up in collaboration with Dr. Laxmi T. Rao (Addtl. Professor of neurophysiology) and with M/S. Axxonet systems, Bangalore

We have also initiated an industry–academia network in collaboration with Prof. V. Mohan Kumar, Emeritus Professor, Sree ChitraThirunal Institute of Medical Sciences & Technology, Thiruvanthapuram, Kerala and with M/S Axxonet Systems, Bangalore to further develop software associated with sleep state analysis and to strengthen sleep research in the country . Future studies include undertaking research studies on sleep disorders, neurodegenerative disorders and to look at the feasibility of yoga/meditation and cognitive retraining strategies in alleviating the sleep problems as well as the disorder itself.

As part of our community outreach activities on sleep and sleep disorders , we conduct at least two CMEs / year in medical colleges . Additionally , we have initiated one-day symposium on sleep and mental health awareness program in other IT institutions . We are yet to initiate public awareness programs on sleep in health with an NGO.

Training opportunities in The Human Sleep Research Laboratory, Department of Neurophysiology, NIMHANS, Bangalore

Two weeks training in Neurophysiology for MD Physiology students of Rajiv Gandhi University of Health Sciences. Here the students get 3-4 days of posting in the human sleep research and cognitive lab. We have a definite module of teaching which include: basics in Electronics, Hands on Training on EEG & Polysomnography using Analogue Grass Polygraph, This can be in a day and one night , sleep stages analysis teaching with R& K manual & Recent AASM manual , One demo on the polysomnography system (neurofax from Nihon Kohden) Theory class on sleep , EEG, polysomnography etc , theory classes on ERPs , demonstartion of ERPs , assignments on all these subjects etc and finally an assessment . The students are posted in other labs then.

B.Tech and M.Tech/ M.Sc/ MD Students who come for 3- 6 months project/ dissertation - we provide them basic training like the one mentioned above as well as give them a part of the ongoing study or give them part of the already acquired data for their dissertation/ project work etc.

Bindu M.Kutty,
Professor
Dept.of Neurophysiology
National Institute of Mental Health and Neurosciences
(NIMHANS Deemed University)
Bangalore 560029, India
Tel:+91-080-2699 5170 (off)
Fax:+91-80-2656 4830 / 2656 2121
e-Mail: bindu.nimhans@gmail.com

Sleep Disorders Research Lab,Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST) Trivandrum, Kerala

Dr. Kamalesh K Gulia is currently working as Scientist & In-charge, Sleep Disorders Research Lab at Biomedical Technology Wing in the Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST), an Institute of National Importance by Govt of India, in Trivandrum. She studied and completed her Doctoral Degree from the University of Delhi availing fellowship from the Council of Scientific and Industrial Research (CSIR), India qualifying the CSIR-NET.

She pursued 'Neurophysiology of Sleep' obtaining research grants from the Indian Council of Medical Research (ICMR) and CSIR during Post-Doc from the All India Institute of Medical Sciences (Delhi), and attained expertise in the advanced neurophysiological techniques availing the International Brain Research Organization, IBRO-International Fellowship working in the Neurophysiology Department at the Fukushima Medical University, Japan in 2006-2007. After return from Japan, she worked as Scientist (in Women Scientist Scheme-A) at the National Brain Research Center, Manesar until 2009.

यदा तु मनसि क्लान्ते कर्मात्मानः क्लमान्विताः ।
विषयेभ्यो निवर्तन्ते तदा स्वपिति मानवः ॥ ३५ ॥

This is the description of normal physiological sleep by Charaka Samhita (The encyclopaedia on the Ayurveda by Sage Charaka) in 1000 BC that means *"When the mind gets tired, when the senses get dulled and incapable, then man goes to sleep".* However, in this advanced era of continuous light and digital technologies, we have disrupted our normal sleep by working round the clock.

Sleep restriction, necessitated by modern lifestyle, is an emerging health concern for all of us as we are coming across several evidences on its adverse effects on our health almost in all age-groups. Sleep especially during pregnancy becomes essential as the early neural networks in developing foetus could be affected during this window. Maternal sleep deprivation, thus, is a potential threatening stress to the growing baby as there are recent reports of increased anxiety disorders and cognitive deficits in theoffspring. There are compelling evidences to suggest that the higher cognitive functions are particularly vulnerable to sleep loss not only during childhood and adult age but also during prenatal period.

According to the World Health Organization, 10-20% of children and adolescents worldwide suffer from developmental disorders (www.who.int/mental_health/maternal-children). The most common among them are anxiety disorders, attention deficit hyperactivity disorder and attachment disordersthat severely influence development, educational attainments and productive lives. However, the controlled studies which ascribe the cognitive deficits of the offspring to sleep deprivation during pregnancy, are limited.

We have documented the effects of sleep loss during 3rd trimester of pregnancy on emotional development and cognitive function of the newborn in animal model. The pups of the rapid eye movement sleep (REM sleep) -deprived dams had reduced ultrasonic vocalizations during developmentindicating impairment in emotional behavior.

In another study, the pregnant rats were deprived of total sleep for 5 h during third trimester. When the ultrasonic vocalizations of their pups were tested in isolation paradigm, it was observed that the neonates of sleep-deprived dams made higher vocalizations. The behaviour testing of weanlings during peri-adolescence in the elevated plus maze showed that these made increased entries into the open arms and higher mobility. Enhanced distress calling during early post nataldays and reduction in risk assessment in weanlings indicate a link between the two behaviours.

We also proposed that the ultrasonic vocalizations during early ontogeny could be used as an acoustic marker for an altered emotional development. We also evaluated maternal sleep-wakefulness and anxiety profile during pregnancy, nursing and post-weaning that would provide crucial guidelines in making critical assessment of post-natal factors for shaping the behaviour of offspring.

The management of insomnia and anxiety during pregnancy is always a challenge. In our laboratory, we are exploring for a safe hypnotic substitute that can be used during pregnancy.

The focus of our research laboratory is to study the role of sleep in developmental programming for cognition and neural dynamics in brain after sleep deprivation using animal models and simulation protocols in human. We evaluate the hypnotic potential of various herbal products mentioned in Ayurveda.

We are also looking into the mechanism for interaction of sleep and thermoregulation for identification of non-pharmacological interventions including Thermal Therapy and Yoga-Meditation for treating insomnia.

Our Team members (from left to right): Patrick Deeh Defo Brice (PhD Scholar & Research Trainee from Cameroon), Ms Arathi R (PhD Scholar, CSIR Fellow), Dr Kamalesh K Gulia (Scientist In-charge), Dr V Mohan Kumar (Visiting Professor), Ms Aswathi BS (PhD Scholar, Inspire Fellow) in front of the Satelmond Palace of the Biomedical Technology Wing Campus of SCTIMST, Trivandrum.

Training Opportunitiesat Sleep Disorders Research Lab, Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST) Trivandrum, Kerala

The Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST) is an Institute of National Importance under the Department of Science and Technology, Govt. of India with the status of University by an Act of Parliament in 1980.

Sleep Disorders Research Lab of SCTIMST provides research training in area pertaining to sleep. This involves preparation and implantation of electrodes (animal model) for sleep-wakefulness in free moving condition, acquisition and analysis of electrophysiological data using polysomnography (both wired and telemetric). There is facility for recording single units and multichannel field potentials in un-anesthetized state. We also have cognitive behaviour testing laboratory with video-tracking system.

Training is given to the interested postgraduates for their project work or those wish to pursue PhD program in the above mentioned area. The international students can also apply as our lab is a recognized laboratory for training and the Sree Chitra Tirunal Institute for Medical Sciences and Technology is a recognized Centre in India.

For project work, the candidate has to contact our laboratory for availability of space and the Deputy Registrar of the Institute. The details can also be viewed on the Institute website.

(http://www.sctimst.ac.in/Academic%20and%20Research/Academic/Admissions/)

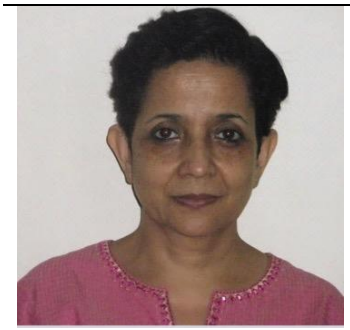
The training can range from one week to 6 months.

News clipping on our research findings
http://epaper.telegraphindia.com/paper/4-0-26@01@2014-1001.html

Events in the region and the World (Nov 2015 to June 2016)

National Sleep Medicine Course, Guwahati, Assam, India. www.issr.in	5-6 Dec 2015
National Sleep Technology Course, AIIMS, Delhi www.issr.in	9-10 Dec 2015
Sleep 2016 Denver http://www.sleepmeeting.org/	11-15 June 2016
ATS 2016 San Francisco http://conference.thoracic.org/attendees/future-conferences/	13-18 May 2016
Chest World Congress 2016 Shanghai China http://www.chestnet.org/Education/CHEST-Meetings/CHEST-World-Congress-2016	15-17 April 2016
Philippine Society of Sleep Medicine SLEEP MATTERS: Discovering the Importance of Sleep, Lung Center of the Philippines	March 18-19, 2016
Philippine College of Chest Physicians 35th Annual Chest Convention	March 2016
Malaysian Thoracic Society Annual Congress, Equatorial Hotel Penang	29-31 July 2016

Sleep Laboratory at the Topiwala National Medical College and BYL Nair Hospital, Mumbai



I have been interested in Sleep Medicine since after Post Graduation i.e. 1983. I initiated the process for purchase of a PSG in 1992 and installed "Sleep Laboratory" in my institute i.e. T N Medical College and BYL Nair Hospitalin 1997, the first in Western India. I have taught sleep and sleep disorders to postgraduates in Chest Medicine and Medicine for over 2 decades. I published, which is to the best of my knowledge, the first case report of OSAS from India in 1995 in Journal of Association of Physicians India. I am a life member of Indian Sleep Disorders Association (ISDA) and until recently was the Governor (West Zone).

I am on the editorial board of the official journal of ISDA, Indian Journal of Sleep Medicine and have published several articles in the journal.I have been appointed as a guide to teach Sleep Medicine to PG fellows doing Fellowship in Paediatric Pulmonology instituted by Paediatric Pulmonology branch of Indian Association of Paediatrics.

Our Sleep Laboratory at the Topiwala National Medical College and BYL Nair Hospital, Mumbai was established in 1997 and was the first in western India. We currently have a one bedded laboratory with 1 limited polysomnography and 2 full polysomnography machines. We have facility for titration with CPAP and bi-level PAP. We perform a lot of ambulatory sleep testing in the wards as well as home based studies.

The team consists of Professor - Dr Jyotsna M Joshi, Additional Professor- Dr Vinaya S Karkhanis, Assistant Prof Dr Unnati Desai and Dr Ketaki Utpat, Medical Officer_ 1, Resident Doctors_ 9.

Our lab has published on various aspects of Sleep Disordered Breathing, summary of which is given below-

Obstructive Sleep Apnea

The risk for OSA using Clinical score (included snoring, witnessed apneas, EDS, Hypertension and Obesity) wa in the study population. Waist circumference and metabolic syndrome were independent risk factors for OSA

Obstructive sleep apnoea (OSA) in octroi employees of Mumbai: Evaluation of waist circumference, d mellitus, metabolic syndrome as risk factors. VS. Karkhanis, J M Joshi. Indian J Sleep Med 2009; 4.3, 100-10

SDB and Chest Disease

In this editorial review article authors discuss about occurrence of different sleep disorders in ILD patients.

Sleep Related Breathing Disorders in Interstitial Lung Diseases J. M. Joshi. Indian J Sleep Med 2007; 2.1, 1-4

Out of 11 cases with kyphoscoliosis who underwent level 3 sleep study, 10 had SDB in the f hypoventilation/hypoxemia which improved with BiPAP but not CPAP.

Sleep disordered breathing in kyphoscoliosis. JM Joshi , KD Modi. Indian J Sleep Med 2010; 5.1, 13-17

Nocturnal oxygen therapy has a beneficial effect on the obstructive sleep apnea syndrome in selected patien and OSAS.

Role of nocturnal oxygen therapy in interstitial lung disease with obstructive sleep apnoea syndrome D. V. M. Joshi. Indian J Sleep Med 2006;1.1, 41-44

SDB and Epidemiology

6.4% of adult Indian population suffers from snoring and prevalence of OSA on the maximum side in th population was 3.42% based on questionnaire study.

P**revalence of symptoms and risk of sleep disordered breathing in Mumbai (India). S Saxena, D Gothi, J M Indian J Sleep Med 2006;1.1, 27-31**

In this retrospective study of 56 children 41% had OSA and craniofacial abnormality was the leading cause c
Surgery improved OSA in children with craniofacial abnormalities.

Sleep Apnea. SKV. Nanaware, D. Gothi and J.M. Joshi. Indian J Pediatr 2006; 73 (7) : 597-601

Case Reports

In this case report authors describe the occurrence of OSA in Miller's syndrome in Indian patient whic
corrected after surgery.

Sleep Apnoea in Postaxial Acrofacial Dysostosis (Miller) Syndrome. A Gangurde, D Gothi, J M Joshi. Inc Sleep Med 2006; 1.4, 211-213

In this case report authors describe the occurrence of OSA in OAVS in 3yr old Indian patient, which got corr
after surgery.

Obstructive Sleep Apnoea (OSA) in a Case of Oculo-Auriculo-Vertebral Spectrum (OAVS) D Gothi, J. M. . Indian J Sleep Med 2006; 1.2, 106-108

In this case report authors report a late onset central hypoventilation syndrome (LO-CHS) with hypotha
dysfunction (HD) and ganglioneuroma presenting at the age of ten years.

Late Onset Hypoventilation Syndrome: Is There a Spectrum of Idiopathic Hypoventilation Syndromes? D. (and J.M. Joshi. Indian J Chest Dis Allied Sci 2005; 47: 293-298

Review articles

In this review article authors discuss the ambulatory approach for management of OSA.

Ambulatory Diagnostic-therapeutic Approach for Obstructive Sleep Apnoea Syndrome (OSAS). J. M. . Indian J Sleep Med 2008; 3.4, 107-111

In this review article authors discuss the peri-operative management of Adult and Pediatric OSA

Perioperative management of adult and pediatric sleep apnoea. Dipti Gothi, JM Joshi. Indian J Sleep Med 2 6.2, 35-43

In this review article authors discuss about the SDB in pediatric agegroup along with its management

Sleep disordered breathing in children. Dipti Gothi, J M Joshi. Indian J Sleep Med 2009; 4.3, 82-90

In this review article authors compare AASM guidelines for sleep staging published in 2007 with R&K guide
and conclude that may be R&K guidelines were good enough for sleep staging.

Sleep staging: Good old R & K! Do we need a revised AASM criteria? J. M. Joshi. Indian J Sleep Med 2009 4-5

In this editorial review article authors discuss about clinical features, diagnostic criteria and treatment optio
Obesity Hypoventilation Syndrome.

Obesity Hypoventilation Syndrome. J. M. Joshi. Indian J Sleep Med 2007; 2.3, 73-79

In this editorial review article authors discuss about clinical features, diagnostic criteria and treatment options for UARS.

Upper airway resistance syndrome: The changing Scenario. D. Gothi, J. M. Joshi. Indian J Sleep Med 2008; 3.2,31-35

We have co-authored the first Indian OSA (INOSA) guidelines that have been published in the Indian Journal of Medical Research. We have co-authored a hand book on Sleep Medicine For the Practicing Physician published and distributed by Lupin Pharma through an educational grant.

Dr Jyotsna M Joshi
email id-drjoshijm@gmail.com
Phone no- 022 23027643

Sleep Disorder Clinic Jaslok Hospital Mumbai

Dr. Preeti Devnani MD,ABPN,D,ABIM,FAASM is the Clinical Director of the comprehensive Sleep Disorder Clinic at the Jaslok Hospital, Mumbai - She is a specialist in Sleep Medicine and Neurology and is board certified by the American Board of Neurology & Psychiatry and American Board of Sleep Medicine.

Dr. Devnani completed Neurology residency, Neurophysiology and Sleep Medicine Fellowships in Chicago, USA.

Dr. Devnani is the recipient of the Young Investigator Research Award from the World Association of Sleep Medicine 2013. She is also a board member and faculty examiner of the Indian Sleep Disorder Association and Indian Sleep Research Society.

Dr. Devnani hosted the Indo-US National Sleep Medicine Course, 2011 Mumbai. She is the Co-Course Director of the Ace School of Sleep Medicine founded in 2011 for training physicians and technicians in the field of Sleep Medicine. She has published several articles and is a principal investigator for various clinical trials. Invited to a forum on Indian National Guidelines,INOSA- Obstructive Sleep Apnea -2014**,** Insomnia National Guidelines-2014

Her special interests include Behavioral Sleep Medicine Sleep in Women and Children and Sleep disturbances in Neurodegenerative disorders. She is also involved in epidemiological surveys in adolescent medicine and autism.

The Sleep Disorders Clinic was established in the year 2007, providing a multidisciplinary approach to the management of Sleep disorders.

She is the Clinical Director of the comprehensive Sleep Disorder Clinic at Khar, Mumbai and at the Jaslok Hospital and Research centre, Mumbai. Our Centre provides consultation for all adult and pediatric sleep related disorders.

She has the privilege of serving on the executive committee of the ISSR and ISDA associations. Dr Devnani is an invited editor of the Indian Journal of Sleep Medicine.

Jaslok Hospital Team

Khar Team

The non- profit arm of Sleep Disorders Clinic also provides counseling to schools, organizes patient awareness programs and employee wellness sessions at corporate firms.

Salient features of Sleep Disorders Clinic

1. Diagnostic testing - Level 1 and Level 3 for detecting Sleep issues. Polysomnography has been conducted for all age group adults as well as pediatric patients. In the lab, we offer the whole night study that is polysomnography starting from 6 yrs and above. At Jaslok hospital and Surya hospital, we conduct sleep study on all age groups.
2. Actigraphy -help monitor the sleep cycle of the patient.
3. Training in Oromyofunctioal therapy
4. Weight Loss Programme
5. Dental devices –For appropriate cases
6. Non pharcological treatments
    a. Phototherapy,
    b. Cognitive Behavior Therapy,
    c. Progressive Muscle Relaxation Therapy.
7. Formal psychometric tests can help assist in targeting psychotherapy.

Our team is actively involved in clinical research in various topics of Sleep Medicine for pediatric as well as adult, a summary of which is mentioned below.

Review Articles

A Review on Management of REM behavior disorders was presented at WASM and subsequently published in Annals of Indian Academy of Neurology 2015.

This review outlines the evidence for behavioral and therapeutic measures along with evidence-based guidelines for their implementation, impact on falls, and effect on polysomnography (PSG) while highlighting the non-motor, autonomic, and cognitive impact of the Management of REM behavior disorders.

Phototherapy: Role in Sleep Disorders (2014).

This review discusses the clinical repercussions of circadian rhythm disorders, the physiological principle of phototherapy and its application across the spectrum of sleep disorders.

Sleep Deprivation and its Consequences (2012),

Review of physiological, metabolic and neurocognitive consequences of sleep deprivation.

Crouzon Syndrome and Obstructive Sleep Apnea (2014)

In this case report , the authors have discussed the clinical manifestation, consequences, and need for management with both temporary and definitive measures of Obstructive sleep apnea syndrome (OSAS).

Spectrum of motor dyscontrol in narcolepsy (2010).

CLINICAL TRIALS

She also conducted a Randomized Double Blind Multicentric Clinical Trial on efficacy of Armodafinil versus Modafinil in Patients of Excessive Sleepiness Associated with Shift Work Sleep Disorder published in Neurology Research International (2011).

ONGOING PROJECTS

At the Jaslok hospital she has an ongoing project on Sleep Characteristics in children with Autism Spectrum Disorder, the pilot study was presented at APSS 2012. This study is analyzing the PSG data with emphasis on sleep architecture, concomitant sleep related breathing disorder, epileptiform discharges with parenteral reports, social quotient and CARS scales.
Ongoing projects involve Demographic study on **Delayed Sleep Phase Syndrome** a clinic based retrospective study of identifiable risk factors, concomitant mood disturbances.

Training Opportunities at Sleep Disorder Clinic Jaslok Hospital Mumbai

Currently at Sleep Disorders Clinic, we have a four weeks to three month observer ship for physicians interested in the field of Sleep medicine. In addition, technologist can spend 3 months as apprentice training.

At the Jaslok Hospital and Research Center unpaid observer post is currently available for a minimum period of six months for physician and the same is available for technicians. A fee is levied by the hospital for any rotating observer attending clinical services at the hospital.

Neurology and Sleep Centre, Delhi

First ISSR Accredited Sleep Lab in India

Dr. MANVIR BHATIA is a Senior Neurologist, Electro physiologist and Sleep Specialist. She is a Director and Senior Consultant Neurology and Sleep Medicine,Saket City Hospital and Neurology &Sleep Centre, New Delhi.

She is a co-director of the Ace School of Sleep Medicine for training physicians and paramedicals in the field of sleep medicine.

She is one of the pioneers in developing the specialty of Neurophysiology and sleep Medicine in the country.

She has more than 25 years of experience in these fields. She was in charge of the Clinical Neurophysiology Laboratory at AIIMS and developed the 'state of art'.Clinical Neurophysiology Laboratory and started the first sleep disorders clinic under Neurology in the country.

Dr.Manvir initiated and was the coordinator of the epilepsy surgery program at AIIMS.

The **'Neurology and Sleep centre'** was established in May 2008 at L-23, Hauz Khas enclave, New Delhi by Dr.Manvir Bhatia. She is a **Senior Neurologist, Electro-physiologist and Sleep Medicine Specialist** with more than 20 years of experience.

Neurology and Sleep Centre offers the following services:

1.**Consultations:**

- **For sleep disorders** such as snoring, obstructive sleep apnea, insomnia, restless leg syndrome, parasomnia, etc .

- **For neurological disorders** such as (headache, epilepsy, stroke, movement disorders, peripheral neuropathy, myasthenia gravis, muscular dystrophy, etc.

Diagnostic Services include:
Sleep facilities for:

- All types of sleep studies (Level 1-4)
- Multiple Sleep Latency test
- Actigraphy
- Various options for titration are also available (CPAP/BIPAP/AVAPS/ASV)

Psychology facility for:

- CBT-insomnia

Electrophysiological tests facilities for:

- Electroencephalography (EEG)
- Video EEG
- EMG
- Nerve Conduction Studies (NCS)
- Repetitive Nerve Stimulation (RNST)
- Visual Evoked Potential (VEP)
- Brainstem Auditory Evoked Potential (BAER)
- Somatosensory (SSEP)

In addition, we maintain continuous two-way communication with the patients AND **ORGANISE regular support group meetings**. The Centre also **conducts trainings** (fellowships for Doctors and Technicians).

Team MembersFrom left to right: Dr.Snigdha (Office manager), Ms.Anu (Neuro technician), Mr.Arun (Sleep technician), Mr.Jaibeer (Sleep technician), Mr.Kuldeep (Sleep technician), Ms.Poonam (Receptionist), Mr.Deepak (Neuro technician)

Team Member	Role
Manager	a. Ensuring co-ordination b. Continuous communication with patients c. Managing web site and social media site d. Organizing patient related events
Receptionist	a. To handle all incoming calls b. To give appointments c. Answer all email queries
Technician	a. To conduct sleep studies b. To score and report sleep studies c. Maintain database and equipments d. To communicate with patients

The centre works very closely with a team of related specialists- ENT specialists, psychiatrists, dietitians, pulmonologists, cardiologists.

Training Opportunities at Neurology and Sleep Centre Delhi

1. **Doctors** of all specialties, Physicians, Pulmonologists, Neurologists, Psychiatrists and **Technicians** interested in sleep technology can come for training to the centre.

2. Technician training will be for 6 months and Doctors training will be for 3 months, 6 months and 1 year.

3. Contact details- Neurology and Sleep Centre, neurologysleepcentre@gmail.com, L-23,Hauz Khas enclave,new delhi-16.

Dr. MANVIR BHATIA
WEBSITE-www.neurologysleepcentre.com
EMAIL-neurologysleepcentre@gmail.com

Publications from Lab

Obstructive Sleep Apnea

To investigate the prevalence of snoring and its risk factors in obese Indian Population
Snoring and its Risk Factors in Obese Indian Population. Bhatia M., Agarwal V, PandeyR.M: Indian J Sleep Med 2006; 1.2, 101-105.

OSAS should be systematically screened at the moment it is clinically suspected in patients with acute stroke
Bhatia M., Stroke and sleep apnoea: Cause or Consequence. Indian Journal of Sleep Medicine; 2006;1 (1): 19-21.

Patients with OSA had significantly higher BMI and ESS score, and were more likely to have hypertension and road traffic accidents
Bhatia M., Kumar V.G.P., Tripathi M, Srivastava A.K, Jain S. Obstructive sleep apnoea: A Case controlled study. Neurology India 2003;51(4):497-499.

Insomnia

SPCs were common in patients with insomnia in an unselected sample of an adult Indian population. Neuroticism, somatic and severe psychological complaints seem to have a strong association with inson in this population

Sharma M., Bhatia M. "Insomnia: Presence of somatic–psychological complaints and personality traits in the Indian population"*Indian J Sleep Med 2012; 7.3, 98-104*

Insomnia evaluation includes a detailed history, with sleep logs which can be used for prolonged period

Bhatia M., ShivplaraN.B. Chronic Insomnia: An Actigraph Evaluation. Indian J. Sleep Med 2006;1.3: 151-153.

Restless Leg syndrome

The diagnosis of RLS is purely clinical and thus depends on accurate history and even less is known abc children. Consequently, RLS in children is underdiagnosed.

Bhatia M., Nandeeshwara SB. Restless Leg Syndrome in Children: an undiagnosed entity. Indian Sleep Med 2007; 2.2, 71 – 72.

The prevalence of RLS in CRF patients in India is very low as compared to the Western population.

Bhowmik D, Bhatia M., Tiwari S, Mahajan S, Gupta S, Agarwal S.K, Dash S.C. Low prevalence restless legs syndrome in patients with advanced chronic renal failure in the Indian population: a controlled study. Ren Fail. 2004; 26 (1): 69-72

The prevalence of RLS was 6.6% in patients on hemodialysis; and 0% in controls, which is much lower that reported from the West.

Bhowmik D, Bhatia M., Gupta S, Agarwal S.K, Tiwari S.C, Dash S.C. Restless legs syndrome in hemodialysis patients in India: a case controlled study. Sleep Medicine.2003;4(2):143-146

Restless legs syndrome (RLS) is a disorder of motor activity with a circadian pattern, occurring frequen patients with Parkinson's disease (PD)

Krishanan P.R, Bhatia M.,Behari M. Restless legs syndrome in Parkinson's Disease: A case-contr study. Movement Disorders.2003; 18(2):181-185.

RLS is a very common problem in dialysis population and was significantly associated with other sleep disorders, particularly insomnia, and EDS

Bhatia M., Bhomik D. Restless leg syndrome in maintenance haemodialysis patients. Nephrol Dial Transplant. 2003;18-217

Narcolepsy

The patient described clinically meets the criteria of narcolepsy with positive history of excessive sleepi cataplexy, excessive dreaming, and disturbed sleep. His overnight PSG with MSLT were suggestive of narcolepsy. This is the first case being reported from India.

Bhatia M, Arif M. A. Narcolepsy an often missed diagnosis: First documented case from India. Neurology India 2009; 57: 509-510.

Comprehensive Sleep Disorders Facility
Department of Neurology,
All India Institute of Medical Sciences, New Delhi, India

Dr. Garima Shukla is Professor of Neurology at the All India Institute of Medical Sciences, New Delhi, India. She heads the Sleep disorders facility at her center and is a senior member of the Comprehensive Epilepsy care team there. Her specialized training, interest and research focus is in Sleep Medicine and medically refractory epilepsy, and the fascinating interface between these areas. She is a recipient of more than 25 academic awards and has more than 100 indexed publications to her credit.

Dr. Shukla graduated from medical school with MBBS (1994) and completed her postgraduate degree (MD) in Medicine (1997) from the Faculty of Medicine, Maharaja Sayajirao University of Baroda, Vadodara, Gujarat.

Subsequently she completed training at the Department of Neurology, All India Institute of Medical Sciences resulting in a post-doctoral specialist certification in DM (Neurology) in 2001.

After completion of her training she was appointed to the faculty at the department of Neurology at AIIMS. She has several academic distinctions during her postgraduate training, having been awarded a gold medal for MD (Medicine) and the Manoharlal Soni 'best student award' at her DM course.

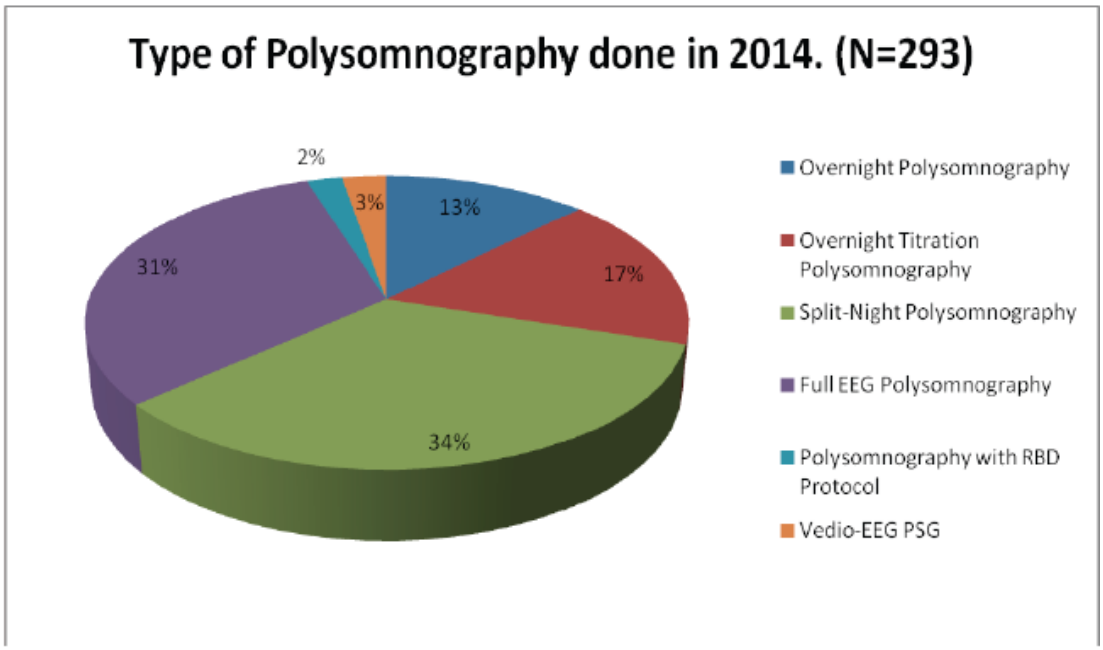
Having chosen epilepsy (especially medically refractory epilepsy) and Sleep Medicine as her areas of interest and research focus, she pursued fellowship training with the Department of Science and Technology, Government of India grant, in Epilepsy, Clinical Neurophysiology and Sleep Medicine at the Cleveland Clinic, Ohio, USA in 2008. She has been actively involved in her research interests, having secured funding and support from National Agencies (ICMR, DST) leading to a well established nationally recognized research program.

The Sleep disorders Clinic and Laboratory has been running in the Department of Neurology, AIIMS, New Delhi, since 1998, initiated by Dr. Manvir Bhatia. At that time, the laboratory space was limited and one bed from our long-term video-EEG monitoring facility was used.

The laboratory:

However, since the year 2005, we have established an advanced Sleep diagnostics facility with a 3-bed laboratory equipped with complete Polysomnography (PSG) equipment, both stationary and portable; with an entire spectrum of diagnostic and titration protocols for adult as well as pediatric patients with all varieties of Sleep disorders.

An example of the type of PSG studies conducted, scored and reported through a meticulous 3-tier (technologist-fellow-Faculty) system over the last year is presented below:



Using various protocols, we have been able to diagnose as well as successfully treat patients with a wide spectrum of multiple and complicated sleep disorders, over the last decade and a half.

In addition, we have been using **Actigraphy monitoring** for various circadian rhythm sleep disorders as well as for patients with Insomnia, both for diagnosis as well as for therapeutic monitoring and bio-feedback.

The Clinic:
Our Sleep disorders clinic is the back-bone of the facility; under which we have developed evaluation tools, interactive patient information methods, customized treatment protocols for all sleep disorders. We have nearly 1000 patients with *Restless legs syndrome (RLS)/Willis Ekbom disease(WED)*, with or without co-morbidities; among which nearly half are those with primary WED.

We have a large database of patients with all types of *Insomnia* following up with us. We have devised a comprehensive AIIMS Insomnia Evaluation questionnaire, which is being validated currently. We have offered very effective Insomnia management to a wide variety of patients through our clinic team.

Patients with the entire spectrum of *Sleep disordered breathing*(SDB) are diagnosed and managed effectively with close follow up and close involvement to encourage adherence to PAP therapy.Our team has successfully used higher positive pressure devices, viz. bilevel PAP – ST mode and adaptive servo ventilation for patients with difficult to treat SDB. Apart from this, we have successfully used multi-modality treatment of SDB for a number of patients.

With the Intractable epilepsy clinic running in parallel with this clinic, we have a large number of patients with various *parasomnias and motor disorders of sleep*, which have been diagnosed and treated through our clinic.

Training opportunities at Comprehensive Sleep Disorder Unit, Department of Neurology, AIIMS, Delhi

We are in the process of initializing a Fellowship program for Sleep Medicine, at the Department of Neurology, AIIMS. Until then, medical graduates, post-graduates and aspiring Sleep technologists can pursue observer ship for up to 3 months, through the Registrar, AIIMS. Apart from this, medical graduates can apply for the PhD program for which information can be obtained through the AIIMS website.

Restless legs syndrome

Shukla G, Goyal V, Srivastava A, Behari M. Quantitative thermal sensory testing and sympathetic skin response testing in primary Restless legs syndrome – a prospective study on 57 Indian patients. Ann Indian Acad Neurol. 2012 Oct;15(4):260-2.

G. Shukla, V. Goyal, S. Singh, A. Srivastava, M. Behari. Varied clinical characteristics of patients with the Restless legs syndrome in India – an observational study. Sleep Medicine, 2009;10(Suppl 2) S33. (Abstract)

Shukla, G., Gupta, A., Pandey, R. M., Kalaivani, M., Goyal, V., Srivastava, A., & Behari, M. (2014). What features differentiate unilateral from bilateral restless legs syndrome? A comparative observational study of 195 patients. *Sleep Medicine*, *15*(6), 714-719.

Anupama Gupta, Garima Shukla, Afsar Mohammed, VinayGoyal, Madhuri Behari. Restless Legs Syndrome, a Predictor of Subcortical Stroke: A Prospective Study on 346 Stroke Patients. Accepted for publication in Sleep Medicine, May 2015.

Sleep and Epilepsy

Zanzmera P, Shukla G, Gupta A, Singh H, Goyal V, Srivastava A, Behari M. Markedly disturbed sleep in medically refractory compared to controlled epilepsy - A clinical and polysomnography study.Seizure. 2012 May 24.

Singh S., Shukla G., Goyal V., Srivastava A. K., Singh M. B., Vibha D., Behari, M. Impact of sleep on the localizing value of video EEG in patients with refractory focal seizures–A prospective video-EEG with EOG and submental EMG study. 2014 *Clinical* Neurophysiology, *125*(12), 2337-2343.

Zanzmera P, Shukla G, Gupta A, Goyal V, Srivastava A, Garg A, Bal CS, Suri A, Behari M.Effect of successful epilepsy surgery on subjective and objective sleep parameters - a prospective study.Sleep Med. 2013 Apr;14(4):333-8.

G. Shukla, V. Goyal, S. Singh, A. Srivastava, M. Behari. Short sleep latencies in patients with epilepsy. Sleep Medicine, 2009;10(Suppl 2) S51. (Abstract)

Ankit Singhal, Garima Shukla, Deepti Vibha, Vinay Goyal, Madhuri Behari, AchalSrivastava.Circadian Sleep Rhythm in Patients with Drug-Refractory Epilepsy: A Case Control Study. Neurology February 12, 2013; 80(Meeting Abstracts 1):P05.018.

Sleep and cerebrovascular disorders (Stroke)

Srijithesh PR, Shukla G, Srivastav A, Goyal V, Singh S, Behari M. Validity of the Berlin Questionnaire in identifying obstructive sleep apnea syndrome when administered to the informants of stroke patients.J Clin Neurosci. 2011 Mar;18(3):340-3.

Shukla Garima, Srijithesh PR. Recognizing the significance of sleep-disordered breathing in cerebrovascular disease – an update. Indian Journal of Sleep Medicine 2010;5(2):43-49.

A Gupta, G Shukla, M Afsar, S Poornima, V Goyal, D Vibha, M Behari. Prevention of new vascular events in patients with obstructive sleep apnea and stroke, using CPAP: A randomized controlled trial. Sleep Medicine 2015. doi: 10.1016/j.sleep.2015.02.525.

Circadian rhythm sleep disorders

Pardasani V, Shukla G, Singh S, Goyal V, Behari M. Abnormal sleep-wake cycles in patients with tuberculous meningitis: A case-control study. J Neurol Sci. 2008 Jun 15;269(1-2):126-32. Epub 2008 Feb 21.

G Shukla. Circadian sleep-wake pattern abnormalities in neuro-infections. Sleep Med8Suppl. 1 (2007) S14.

Shukla Garima. Circadian Rhythm Sleep disorders. Indian J Sleep Med 2011;6(2):44-48.

Garima Shukla, Bhavna Kaul, Anupama Gupta, Vinay Goyal, Achal Srivastava, Madhuri Behari. Parkinson's Plus syndromes presenting with Circadian rhythm sleep disorder – advanced sleep phase type: case reports and review of literature. Accepted for publication in National Medical Journal of India, June 2015.

Sleep disordered breathing

Garima Shukla. Recognition and consequences of Sleeping Disorders in Hypoventilation Syndromes. In ' Practical Approach to Critical Respiratory Medicine, Sleep Disorders & Fiber-optic Bronchoscopy" edited by VK Arora, Addl DGHS, Govt of India.

G Shukla, A Gupta, N Gupta, M Kabra. Spectrum of sleep disordered breathing among patients with mucopolysachharidoses: a clinico-polysomnographic study. Sleep Medicine 2013;145:e267.

Srijithesh PR, Shukla G, Srivastav A, Goyal V, Singh S, Behari M. Validity of the Berlin Questionnaire in identifying obstructive sleep apnea syndrome when administered to the informants of stroke patients.J Clin Neurosci. 2011 Mar;18(3):340-3.

Sharma SK, Katoch VM, Mohan A, Kadhiravan T, Elavarasi A, Ragesh R, Nischal N, Sethi P, Behera D, Bhatia M, Ghoshal AG, Gothi D, Joshi J, Kanwar MS, Kharbanda OP, Kumar S, Mohapatra PR, Mallick BN, Mehta R, Prasad R, Sharma SC, Sikka K, Aggarwal S, Shukla G, Suri JC, Vengamma B, Grover A, Vijayan VK, Ramakrishnan N, Gupta R, INOSA Guidelines Working Group FI. Consensus and evidence based INOSA guidelines 2014 (First Edition) Indian J Med Res. 2014 Sep;140(3):451-68.

Gupta A, Shukla G, Mohammed A, Goyal V, Srivastava A, Behari M. History of dream enacting behavior in patients with obstructive sleep apnea. SLEEP, vol.35, Abstract supplement 2012.

Shukla G, Gupta A, Mohammed A, Goyal V, Srivastava A, Behari M. Does REM predominant sleep apnea present as a distinct phenotype? – A case-control study from North India. SLEEP, vol.35, Abstract supplement 2012.

Shukla G, Gupta A, Goyal V, Behari M. Polysomnographic determinants of requirement for advanced positive pressure therapeutic options for obstructive sleep apnea. Sleep 2014;37(Suppl) A 127.

A Gupta, G Shukla, M Afsar, S Poornima, V Goyal, D Vibha, M Behari. Prevention of new vascular events in patients with obstructive sleep apnea and stroke, using CPAP: A randomized controlled trial. SleepMedicine 2015. doi: 10.1016/j.sleep.2015.02.525.

Sleep disorders - general

Ramakrishnan S, Juneja R, Bardolei N, Sharma A, Shukla G, Bhatia M, Kalaivani M, Kothari SS, Saxena A, Bahl VK, Guleria R. Nocturnal hypoxaemia in patients with Eisenmenger's syndrome – a cohort study. BMJ Open. 2013 Mar 11;3(3).

Sharma, PK., Shukla, G., Gupta, A., Goyal, V., Srivastava, A., & Behari, M. (2013). Primary sleep disorders seen at a Neurology service-based sleep clinic in India: Patterns over an 8-year period. *Annals of Indian Academy of Neurology*, *16*(2), 146

REM sleep behavior disorder

Vibha D, Shukla G, Singh S, Goyal V, Srivastava AK, Behari M. Lower prevalence of sleep disturbances in familial versus sporadic Parkinson's disease: a questionnaire based study. J Neurol Sci. 2010 Aug 15; 295(1-2):27-30. Epub 2010 Jun 11.

Vibha D, Shukla G, Goyal V, Singh S, Srivastava AK, Behari M. RBD in Parkinson's disease: a clinical case control study from North India.Clin Neurol Neurosurg. 2011 Jul;113(6):472-6.

Rai, N. K., V. Goyal, G. Shukla, A. K. Shrivastava, and M. Behari. "REM behavioral disorder (RBD) in Parkinson's disease. Movement Disorders, vol. 28, pp. S294-S295. 2013.

Sleep Clinic,Himalayan Institute of Medical Sciences, Dehradun

Dr Ravi Gupta joined the Department of Psychiatry, SMS Medical College, Jaipur as postgraduate trainee in 2000. During his residency program, he developed an inclination towards Sleep Medicine. However, its clinical transformation remained limited to the sleep disorders associated with Psychiatric disorders. In 2008, he left the academic position to pursue his interest in Sleep Medicine and started his own clinic in Jaipur with one Sleep-laboratory. In 2010, he was awarded the mini-fellowship from American Academy of Sleep Medicine.

He joined his present institute in 2010 and started the Sleep Clinic and Sleep-laboratory.

Presently, he is working as Associate Professor in Department of Psychiatry, Himalayan Institute of Medical Sciences, Dehradun and also the in-charge of Sleep Clinic and sleep laboratory.

Clincial Services:
Sleep Clinic was established in the Himalayan Institute of Medical Sciences, Dehradun in year 2011. Currently, this clinic is catering patients with all kinds of sleep disorders, however, most commonly seen patients belong to the diagnostic categories of insomnia, restless legs syndrome and obstructive sleep apnea. Presently we are running a single bedded laboratory with video-synchonized 32 channel polysomnography machine. We also perform CPAP and BPAP titration manually.

Training:
We are also involved in providing training to the physicians and technicians interested in sleep medicine. As of now we have provided short term training (2 weeks) in PSG scoring to 4 Physicians and 7 technicians. Two Physicians who spent one year in the clinic and the laboratory as trainee have also cleared the sleep physician certification examination conducted by Indian Society for Sleep Resaearch and organized by World Sleep federation in 2015.

The **team** consists of –**Front row**(Left to Right): Dr Ravi Gupta (Psychiatrist), Dr Deepak Goel (Neurologist), , Dr Sanjeev Kumar (Pulmonologist), Dr Rakhi Khanduri (Pulmonologist).

Standing(left to right)**:** Sleep Tecnicians: Subodh Gaur, Pankaj Kumar, Shivani Goel, Manoj Kumar (not in photo) and Dr Girish Sindhwani (Pumonologist)

Training opportunities at Sleep Clinic, Himalayan Institute of Medical Sciences, Dehradun

Physician's Training is open to the medical doctors having MBBS degree and having an inclination towards Sleep Medicine. Specialists like pulmonologists, psychiatrists, general physician and Neurologists are also welcome.

For the technician training we prefer the technicians having knowledge of EEG, although respiratory technicians are also welcome.

The training program is tailored made. Duration of the training depends upon the requirement of trainee. For doctors, training can be limited to the Sleep Clinic and working up the patients with sleep disorders or can also include the work in the sleep lab that includes hooking up the patient, scoring of the sleep data and manual titration of the CPAP. Sleep technicians are restricted to the work in Sleep laboratory.

For the training university charges a nominal fee. Further details may be sought from Dr. Ravi Gupta. His contact details are:

Ravi Gupta MD, PhD
Associate Professor,
Department of Psychiatry & Sleep Clinic,
Himalayan Institute of Medical Sciences,
Swami Ram Nagar,
Jolly Grant, Dehradun-248016
e-mail:sleepdoc.ravi@gmail.com
+91-9 45 89 42 135

Research- Our lab has published on various aspects of sleep disorders, summary of which is given below-

Insomnia

1. **Sleep pattern and insomnia among medical students: effect of gender and dysfunctional belief and attitudes about sleep. Joshi K, Mishra D, Dubey H, Gupta R. Somnolgie 2015; 10.1007/s11818-015-0012-x**

Medical Students have delayed sleep phase type pattern and 5% suffer from insomnia. Dysfunctional beliefs and attitudes about sleep are common in this group.

2. **Prevalence and correlates of insomnia and obstructive sleep apnea in CKD subjects. Ahmad S, Gupta M, Gupta R, Dhyani M. *North Am J Med Sciences* 2013 ;5:641-6**

Among CKD patients who are on maintenance hemodialysis nearly half are at high risk for obstructive sleep apnea and one third have insomnia.

3. **Subjective sleep problems in young women suffering from pre menstrual dysphoric disorder. Gupta R, Lahan V, Bansal S. *North Am J Med Sci* 2012;4:593-5**

PMDD is associated with poor sleep quality.

4. **Insomnia associated with depressive disorder: primary, secondary or mixed? Gupta R, Lahan V. *Indian J Psychol Med* 2011; 33: 123-128**

Insomnia associated with depressive disorder has characteristics of primary insomnia

Restless legs Syndrome

3. **What patients do to counteract the symptoms of restless legs syndrome: effect of gender and severity of illness. Gupta R, Goel D, Ahmad S, Dhar M, Lahan V. *AIAN* 2014; 17: 405-408**
Patients with RLS adopt a variety of strategies e.g., walking, massage, tying cloth on legs which are influenced by severity of RLS and gender.

4. **Clinical presentation of restless legs syndrome: does the gender matter? Gupta R, Ahmad S, Dhar M, Goel D, Lahan V. *Sleep Biol Rhythms* 2014*; 12: 180-186***
Female preponderance in RLS is not related to the clinical symptoms.

5. **A study examining depression in restless leg syndrome. Gupta R, Lahan V, Goel D. *Asian J Psychiatry 2013; 6: 308-312***

   Nearly one third of RLS pateints suffer from clincial depression. It is not related to sleep disturbance or disease severity.

6. **Restless legs syndrome: common disorder but rarely diagnosed, barely treated- an Indian experience. Gupta R, Lahan V, Goel D. *Sleep Med 2012;* 13: 838-41**

   Despite being prevalent condition, RLS often remains undiagnosed till a person reaches a sleep clinic.

7. **Primary headaches in RLS patients. Gupta R, Lahan V, Goel D*. Annals Indian Acad Neurol* 2012; 15: 104-8**

   Nearly half of the RLS patients suffer from headache of which, most commonly is migraine.

Obstructive Sleep Apnea

1. **Sleep stage independent obstructive sleep apnea: an unidentified group. Gupta R, Lahan V, Sindhwani G. *Neurol Sciences* 2013; 34: 1543-1550**

   Besides the patients who have OSA predominantly in REM or NREM, one group has OSA which is equally severe in both sleep stages.

2. **Prevalence of obstructive sleep apnea in surgical patients presenting to a tertiary care hospital in India: A preliminary study. Agrawal S, Gupta R, Lahan V, Mustafa G, Kaur U. *Saudi J Anesthesia*2013; 7: 155-159**

   Nearly one fourth of the patients undergoing surgery screened positive for OSA.

Review Articles

1. Co-morbid depression in Obstructive Sleep Apnea: An under-recognized association. BaHammam A, Kendzreska T, Gupta R**,** Ramasubramanian C, Neubeaur DN, Narsimhan M, Pandi-Perumal SR, Moscovich A. *Sleep and Breathing* 2015; DOI 10.1007/s11325-015-1223-x

2. When insomnia is not just insomnia: the deeper correlates of disturbed sleep with reference to DSM-5. Gupta R, Zalai D, Spence DW, BaHammam A, Ramasubramaniam C, Monti JM, Pandi-Perumal SR. *Asian J Psychiatry* 2014; 12C: 23-30

3. The association between migraine and restless legs syndrome: an appraisal. Gupta R, Spence DW, BaHammam AS, Monti JM, Seithikurippu Ratnas P. *Somnolgia* 2014; 10.1007/s11818-013-0650-9

Translation and validataion of instruments in Hindi Language

1. Hindi translation and validation of Cambridge-Hopkins diagnostic questionnaire for RLS (CHRLSq). Gupta R, Allen RP, Pundir A, Das S, Dhyani M, Goel D. Ann Ind Acad Neuro1 2015; 18: 303-308

2. Hindi Translation and validation of Dysfunctional Beliefs and Attitudes about Sleep (DBAS - 16). Dhyani M, Rajput R, Gupta R *Ind Psyhciatry J 2013; 22: 80-5*

3. Translation and validation of Restless leg Syndrome Quality of life questionnaire in Hindi language. Vishwakarma K, Lahan V, Gupta R, Goel D, Dhasmana DC, Sharma T, Kalra J. *Neurol India* 2012; 60: 476-80
4. Translation and validation of Insomnia Severity Index in Hindi. Gupta R, Lahan V. *Indian J Psychol Med* 2011; 33: 172-176
5. Translation and validation of international restless leg syndrome study group severity rating scale (IRLS) in Hindi. Gupta R, Lahan V, Goel D. *Ann Indian Acad Neurol* 2011; 14: 257-161

Case Reports

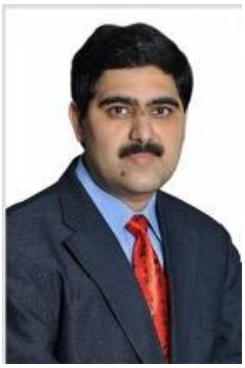
6. Head banging persisting during adolescence: a case report with Polysomnographic findings. Gupta R, Goel D, Dhyani M, Mittal M.. *JNRP* 2014; 5: 405-409

7. Idiopathic Central Sleep Apnea: An Indian case with Polysomnographic findings. Gupta R, Sindhwani G, Rawat J, Kesarwani V. *Indian J Chest Dis All Sci* 2014; 56: 41-44

8. Klein Levine Syndrome: A case report with review of literature. Das S, Gupta R, Dhyani M, Raghuvanshi S *Pediatric Neurology* 2014; 50: 411-16

1. REM sleep behavior disorder in Parkinson's disease: A case from India confirmed with polysomnographic data. Gupta R, Goel D, Farney R, Walker J. *JNRP* 2013; 4: 91-94
2. Restlessness in right upper limb as the sole presentation of restless legs syndrome. Gupta R, Lahan V, Goel D. *JNRP* 2013; 4: 78-80
3. RLS relieved by tobacco chewing: paradoxical role of nicotine. Lahan V, Ahmad S, Gupta R**.***Neurolo Sci 2012;* 33: 1209-1210
4. Narcolepsy: a case from India with polysomnographic findings. Gupta R, Goel D, Farney R, Walker J. *Neurol India* 2012; 60: 79-81
5. Kleine-Levin Syndrome and idiopathic hypersomnia: spectrum disorders? Gupta R, Lahan V, Srivastava M.. *Indian J Psychol Med* 2011; 33: 194-198

Nithra Institute of Sleep Sciences, Chennai: A quality journey



Dr. Ramakrishnan is an American Board Certified in Internal Medicine, Critical Care Medicine & Sleep Medicine & also has a Master's degree in Medical Management (MMM) from University of Southern California. He is a Fellow of American College of Physicians (FACP), American College of Chest Physicians (FCCM), American College of Critical Care Medicine (FCCM) and Indian Society of Critical Care Medicine (FISCCM). He has been practicing Critical Care Medicine for over 18 years and Sleep Medicine for over 16 years.

He is currently Senior Consultant in Critical Care & Sleep Medicine and Director, Critical Care Services for Apollo Group of Hospitals. He established Nithra Institute of Sleep Sciences in 2004 which is the first-of-its-kind freestanding comprehensive sleep center. The Institute prides itself with being the first institution to offer University affiliated post doctoral fellowship in Sleep Medicine and also being the first Sleep Center to be accredited by National Accreditation Board of Hospitals and Healthcare Organizations (NABH).

Dr. Ramakrishnan is currently Vice Chancellor of Indian College of Critical Care Medicine, the academic wing of Indian Society of Critical Care Medicine. He is the Immediate Past President of Indian Sleep Disorders Association (ISDA) and has been involved in designing the Indian Diploma in Sleep Medicine.

He was honored with fellowship amongst the first group of Sleep Medicine specialists in 2011 and also received Philips ISDA Oration. Dr. N. Ramakrishnan is keen on educating healthcare professionals and the general public on sleep problems and has authored books in Tamil and participates in healthcare awareness programs of print and visual media.

Evolution of Sleep Medicine in India in the past decade:

Sleep medicine in India is a growing medical subspecialty in India. A decade back, dedicated sleep medicine specialists and centres were far and few. The practice of sleep medicine at that time was predominantly an extended domain of neurologists, pulmonologists and ENT specialists who focused on specific aspects of sleep pertaining to their speciality. Over the years, national societies in sleep medicine (Indian Sleep Disorders Association and Indian Sleep Research Society) and returning sleep specialists with international training and certification have created awareness amongst medical fraternity and the general public.

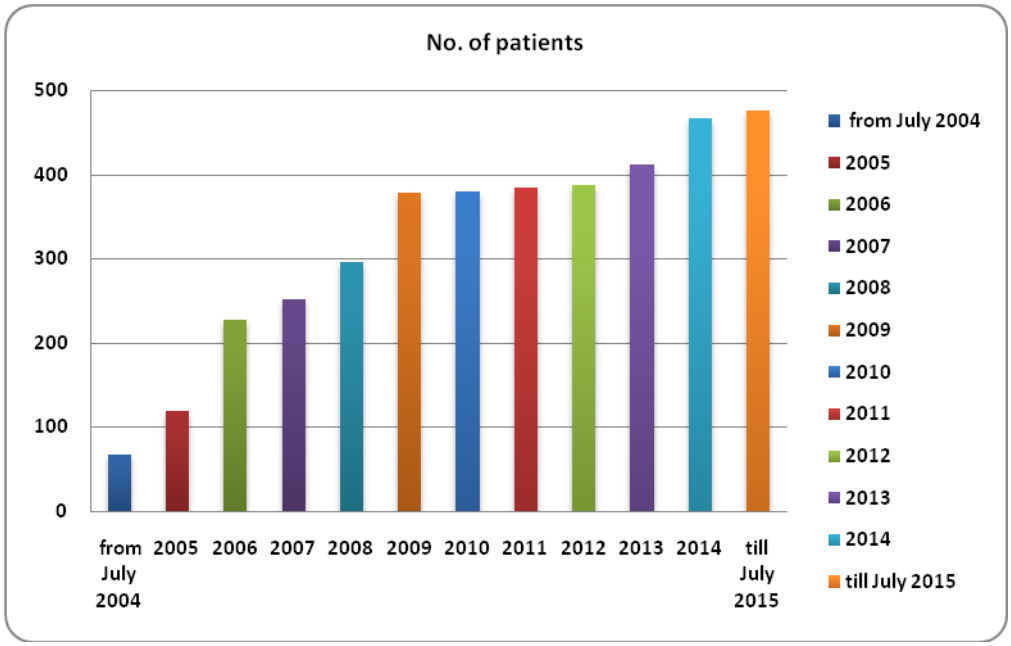
The number of hospital based and independent sleep centres has certainly been on the rise but more in urban areas and still inadequate in Tier 2 cities and rural areas.

Nithra Institute of Sleep Sciences, Chennai, is India's first freestanding comprehensive center for Education, Training, Diagnosis and Treatment for sleep related problems. The center was started in July 2004 by Dr. N. Ramakrishnan who is American Board Certified in Internal Medicine, Critical Care Medicine & Sleep Medicine. The team comprises of Dr. N. Ramakrishnan (Medical Director), Dr. Ashwin Mani (Pulmonologist), Dr. Dedeepiya Devaprasad (Internal Medicine), Ms. Mary Isabel (Administrator), Ms. Hema Deenadayalan (Clinical Dietician), Sleep technicians (Mr. Vijay, Ms. Aruna & Ms. Sathiya and other part time tehcnicians), Lab technician (Ms. Devi). We share our experience of challenges and success over the past decade.

CLINICAL EXPERIENCE: PATIENT PROFILE

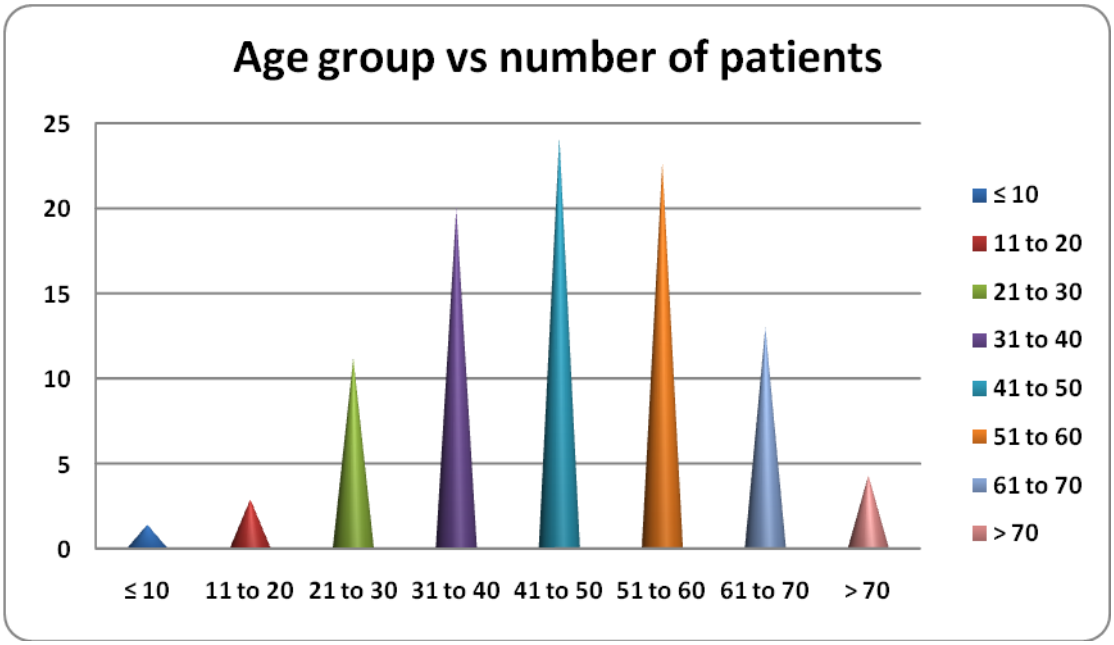
Patient volume

The graph in Figure below depicts the growth pattern in patient volume. From a small number in 2004 (64 patients from July to Dec), there has been a steady increase in the number of new patients who have registered in the clinic with the total number close to 4000. This reflects a combination of increasing awareness and willingness to seek attention for medical problems.



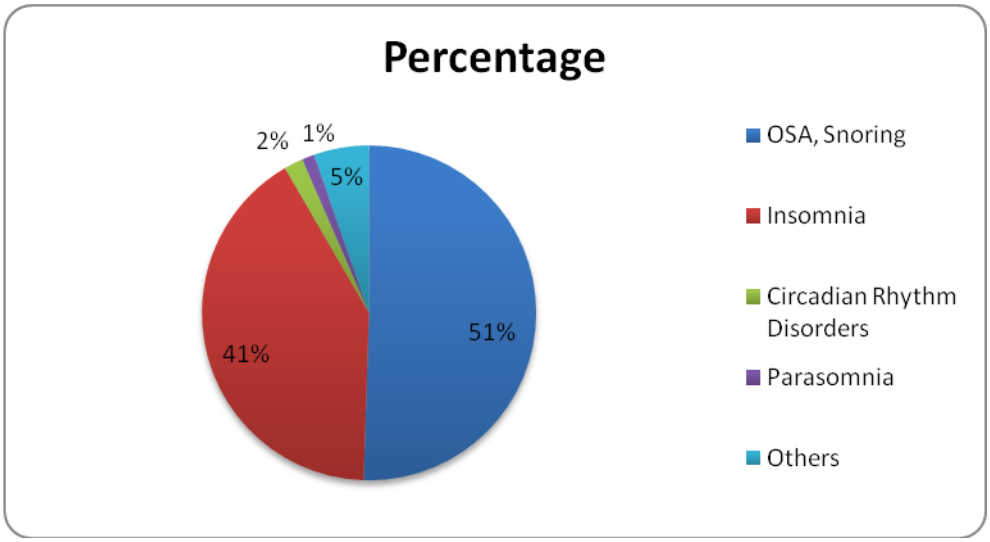
Age and Gender of patients

There was a predominance of male patients (76.3%). Patients in the age group of 41-50 yrs represented the highest proportion (24%) and pediatric age group representing the least (1.4%).



Sleep disorders

The most common presenting sleep disorder was Obstructive Sleep Apnea (OSA) (50.5%), followed by Insomnia (41%). Circadian Rhythm disorders constituted 1.8%, and other sleep related disorders such as Narcolepsy, Restless Leg Syndrome (RLS) / Periodic Limb Movements Disorder (PLMD), Nocturnal Seizures, Bruxism and Fragmented sleep together constituted 5.35%.

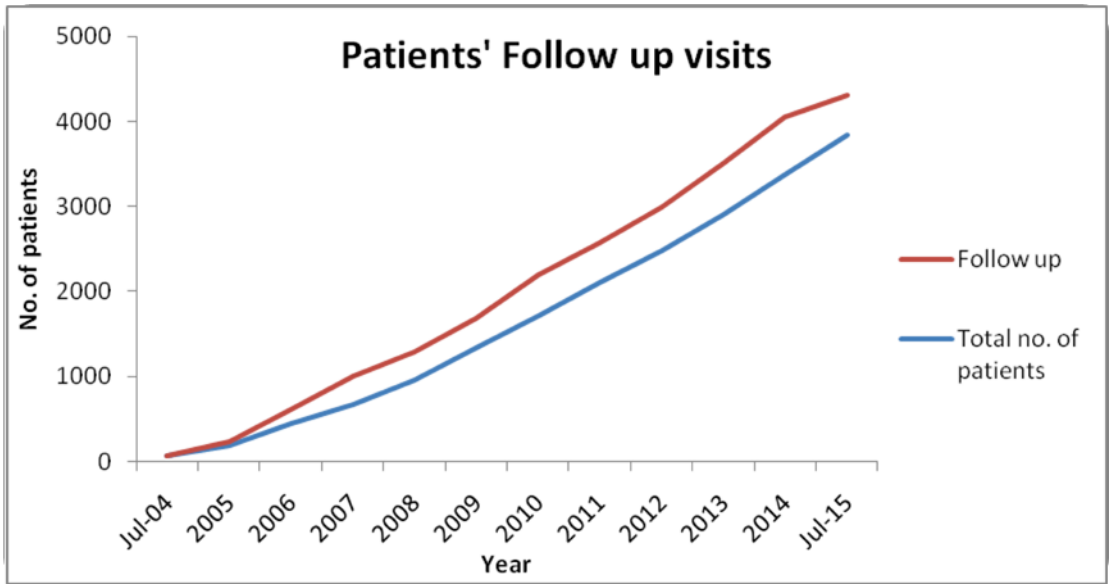


Referral pattern

Patients presented to the Sleep clinic either referred by other physicians or on their own based on information available on print media and internet. Interestingly a majority of patients (55.6%) presented on their own and others were referred by physicians including Neurologists, Endocrinologists, Cardiologists Psychiatrists, ENT specialists and General physicians.

Patients' Follow up visits

Patients who follow up are usually less, although the percentage has increased over the years from 10% in 2005 to 25% in 2014.



ACADEMIC JOURNEY

Nithra Institute of Sleep Sciences has been accredited for one year fellowship training by Indian Sleep Disorders Association (ISDA). The institution also offers one year post doctoral fellowship accredited by Tamilnadu Dr MGR Medical University which is the first University affiliated training program in sleep medicine in India.

Short term training programs (two weeks) are offered for doctors that have gained popularity and sought by physicians from various parts of India and also a few International Physicians. Certified Polsymnography Technician (CPT) training programs have been offered and successful candidates have had immediate job placements.

Nithra Institute of Sleep Sciences hosted International Sleep Conference in association with Indian Sleep Disorders Association (ISDA) in 2009 and 2014. The center has also been publishing original research in peer reviewed journals and collaborated with other academic centers in research projects.

PUBLIC EDUCATION:

Creating awareness amongst general public has been a core mission and commitment of Nithra. Awareness camps, print and visual media campaigns are periodically organized. Our website (www.nithra.com) provides information on sleep disorders and books (print & audio books) have been published. Support group meetings are organized where patient families exchange information and the staff of Nithra provide supplemental information and advice.

QUALITY JOURNEY:

Nithra Institute of Sleep Sciences has always been committed to quality and received ISO accreditation since early years. The institution also became the first allopathic clinic in south India to receive accreditation from National Board of Hospitals and Healthcare Organizations (NABH) in 2004 and currently is the only sleep center to have this recognition.

WAY FORWARD:

Awareness about sleep problems and treatment options is steadily increasing in India although still far from desirable. OSA and Insomnia are leading problems, although circadian rhythm problems are also on the rise because of the Business Process Outsourcing (BPO) industry providing services to varied time zone. The predominance of self-referrals in comparison to physician referrals highlights the impact of media and internet on knowledge dissemination to the public and also the need to include Sleep Medicine in medical curriculum.

Team from left to right: Mr. Arun Samuel Ponnish – Respiratory therapist, Ms. Lakshmi Ranganathan – Clinical Research Manager, Ms. Hema Deenadayalan – Dietitian, Ms. Preethi - Quality Systems Executive, Ms. Sailaja – Administrative assistant, Ms. Sathyakala – Sleep technician, Mrs. Lalitha Ramakrishnan – Director, Nithra Institute of Sleep Sciences , Dr. N. Ramakrishnan – Managing Director, Nithra Institute of Sleep Sciences, Mr. Vijay – Sleep technician, Mr Dheepan Chakravarthy- RPSGT, Ms. Mary Isabel – Administrative Coordinator, Ms. Devi – Lab technician

Training opportunities at Nithra Institute of Sleep Sciences, Chennai

Nithra Institute of Sleep Sciences has the unique distinction of offering the first University affiliated postdoctoral fellowship in Sleep Medicine. Our training program is accredited by The Tamilnadu Dr. MGR Medical University. In addition we are accredited by Indian Sleep Disorders Association to train post graduate doctors for one year diploma in sleep medicine. We also offer short term training programs for doctors and sleep technicians

(1) Post doctoral Fellowship in Sleep Medicine (The Tamilnadu MGR Medical University)

Course Duration: One Year

Eligibility: Doctors with Post graduate degree in Medicine, Chest Medicine, Psychiatry, and Neurology are eligible to apply

(2) Diploma in Sleep Medicine (Indian Sleep Disorders Association)

Course Duration: One Year
Eligibility:Doctors with postgraduate qualification in Internal Medicine, Chest Medicine/Pulmonary Medicine, Psychiatry, and Neurology & ENT are eligible to apply.

(3) Short Term Courses in Sleep Medicine Only for Doctors

- **Basics of Sleep Medicine – One Week Course**
- **Essentials of Sleep Medicine – Two weeks Course**

(4) Certified Polysomnography Technician (CPT) – 6 months

Interested Candidates can send their CV to info@nithra.com

For more details please log on to http://www.nithra.com/education-training/

Sleep lab, St. John's Medical College Hospital
Department of Pulmonary Medicine
Bangalore, Karnataka

Sleep lab was added to the Department of Pulmonary Medicine on 2000. Since then the following services has been regularly offered. We are doing Polysomnography Level 1 and Level 3, MSLT, Titration, BIPAP, and Suggested immobilization test being done regularly. Now we have grown and have the capability to do 2 sleep studies per day with video monitoring.

Achievements:

- Sunad Rangarajan postgraduate student got Eilio Lugarasei and Christian Guilleminault young scientist award in WASM 2007 held in Bangkok Thailand.

- Dr. Priya Ramachandran and Dr. Uma Devaraj have been certified as international sleep disorders specialist by World Association Sleep Medicine, Congress (WASM) in Seoul, Korea 2015.

Publications:

1. Obstructive sleep apnea in patients with MI, experience from tertiary care hospital in south India. Uma Devaraj, Priya Ramachandran, George D'souza- Heart India, 2013, vol 1, issue 1, page 12-16, web publication 17/6/2013
2. Restless leg syndrome in an Indian urban population. Sunil Rangarajan, Sunad Rangarajan, George D'souza, sleep medicine, Dec 2007, vol 9, issue 1, page 88-93
3. Restless leg syndrome in Indian patients having iron deficiency, anemia in tertiary care hospital. Sunad R, George D'souza. Sleep medicine, April 2007, vol 8, issue 3, page- 247-251
4. Insulin Resistance in Moderate to Severe Obstructive Sleep Apnea in Non diabetics and Its Response to Continuous Positive Airway Pressure Treatment. Archana Babu rao, George D. Souza North American Journal of Medical Sciences | Oct 2014 | 6/10/500-504

Abstract

1. Lack of awareness of sleep disorders in trainee doctors. Uma Devaraj, Sunad R, Avinash, Srikanth, Priya Ramachandran, George D'souza. WASM congress, Bangkok Thailand 2007.

2. Stepwise model of screening questionnaire and level 3 sleep study to detect obstructive sleep apnea in a rural setting in India. Ashna M. Pinto, UD, PR, B. Joseph, GDS- NAPCON 2014, Agra.

3. CPAP Compliance among Patients with Moderate / Severe OSA – Appearances Are Deceptive. Sandeep , Uma Devaraj, Priya Ramachandran, George D'souza

4. Undiagnosed Obstructive Sleep Apnea and Post-operative Outcomes: A Prospective Observational Study from Tertiary Care Center. Ajay, Uma Devaraj, Priya Ramachandran, George D'souza

5. Prospective study of characteristics of patients undergoing polysomnography- Dr. Priya Ramachandran, Uma Devaraj, George D'souza

Training Opportunities at Sleep lab, St. Johns Medical College Hospital, Bangalore

- Fellows and DM students undergo constant training in sleep during their residency program.

- We offer certified training courses for sleep technicians. So far 8 technicians have been trained.

- The training program can be tailor made to the needs of the technicians / doctors (preferably MD chest / Medicine). Email Id- hod.chest_med@stjohns.in Contact No- 080-22065802

SLEEP LAB AT PONDICHERRY INSTITUTE OF MEDICAL SCIENCES (PIMS),

PONDICHERRY

Dr. Subhasis Das is an MD in Physiology. He has 13 years experience in teaching Physiology to both undergraduate and postgraduate students. Prior to that he has had 8 years of experience working as an Emergency Medical Officer in various institutions. Primarily a medical teacher, his involvement with sleep disorders was quite by accident. From 2012 onwards he has been managing the sleep lab in the Pondicherry Institute of Medical Sciences.

Pondicherry Institute of Medical Sciences is a multispecialty tertiary care hospital which also undertakes graduate and postgraduate medical training. It is the only medical college and the only hospital of its kind on the East Coast Road from Chennai leading in to Pondicherry.

The sleep lab in Pondicherry Institute of Medical Sciences was conceptualized in early 2011. Initially it was a collaborative project involving the Departments of Physiology, Pharmacology, Pulmonary Medicine and Neurology. The final design of the lab, the finer details of its functioning, procurement of equipment and training of personnel was ultimately envisaged and brought to fruition by Dr. Tripat Deep Singh, then a teaching faculty of the Department of Physiology in this institution. The lab was inaugurated on 29th April, 2011 and was made fully functional on the 1st of October, the same year.

Since its inception, the lab has undertaken 115 sleep studies, dealing mostly with sleep apnea patients, almost all of whom are referred by the Department of Pulmonary Medicine, with the exception of a few from the departments of Medicine, ENT and Nephrology.

A few diagnostic studies for REM Behavioral Disorders (one of which turned out to be a case of myoclonic seizures) and one Multiple Sleep Latency Test for narcolepsy have also been undertaken, with patients being referred by the Departments of Neurology and Psychiatry.

Research is also on the lab's agenda, with postgraduate trainees getting involved with the process. Since this is the only sleep lab in the region which handles patients, the nearest alternative being in Chennai, about 150 km away, a number of extra-institutional references are also received on a regular basis.

At present the lab functions under the aegis of the Physiology department. It is a single bedded arrangement running an Alice 5 machine. The lab conducts Level 1 sleep studies, attended by a technician, a technologist trained in neurosciences and EEG interpretation and one or two teaching faculty from the Physiology Department, along with on call doctors from the referring departments. All three faculty members from the department, who are available to attend to sleep studies, have attended the National Sleep Medicine Course and the Sleep Technician's Workshop at NIMHANS, Bengaluru in December 2012. The tests offered are diagnostic studies, CPAP or BiPAP titration studies, split night studies, MSLTs and MWTs. The reporting of the studies is done manually.

The sleep lab team of the Pondicherry Institute of Medical Sciences, under the guidance of Dr. Tripat Deep Singh, has conducted two workshops on Polysomnography in 2011 and 2012 in this institution. These workshops were open to participants from all around the region. The team has also conducted two CME programs for the medical fraternity. In collaboration with the Department of Pulmonary Medicine, the team is in the process of conducting awareness programs for the local General Practitioners as well as the general public, by means of seminars, radio talks and television advertisements.

This sleep lab team hopes to further the cause of sleep medicine with more of such awareness programs. The lab and its team are currently geared for undertaking 1-month and 3-months structured training programs for sleep lab technicians.

THE P.I.M.S. SLEEP LAB TEAM

Sitting (L to R): Dr. Jayanthi Arulneyam (Neurology), Dr. Jayita Poduval (ENT), Dr. Subhasis Das (Physiology), Dr. King H Kisku (Pulmonology)

Standing (L to R): Dr. Sathiyamoorthy P (Senior Resident), Mr. Mohan (Technician), Ms. Suganthi B (Senior Technologist), Dr. Rekha D (Senior Resident) (all from Physiology)

Training opportunities at Sleep Lab Pondicherry Institute of Medical Sciences, Pondicherry

The lab and its team are currently geared for undertaking 1-month and 3-months structured training programs for sleep lab technicians.

For more details please contact the below person-

Dr. Subhasis Das
Professor, Dept. of Physiology
PIMS Pondicherry
Tamilnadu.
Email id- subhasiscmc@gmail.com
Phone no- 9003547368

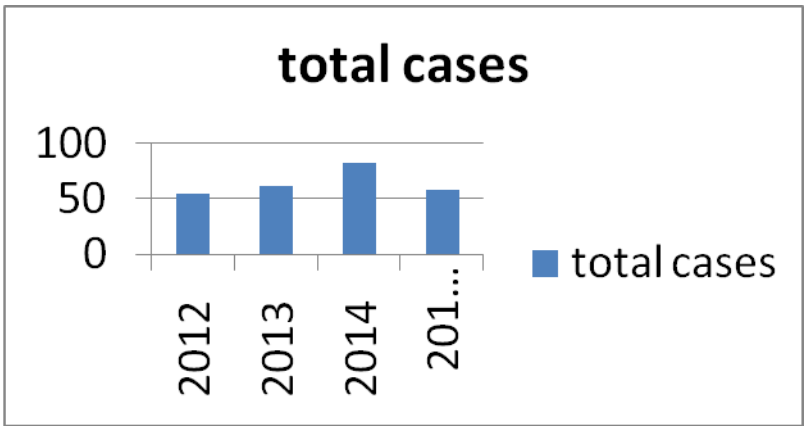
Sleep Laboratory at International Hospital and Nightingale Hospital, Guwahati, Assam

Sleep Laboratory at the International Hospital and Nightingale Hospital, Guwahati was established in 2012 and was the first in North-East India. It was an initiative from Dr Gautam Khaund, ENT surgeon from Nightingale Hospital lead to the sleep lab in the hospital. I am working as visiting consultants with Kanak Huzuri as a well trained sleep technician. We have planned to start state of the Art sleep laboratory in Gauhati Medical College, Guwahati and it may come in reality by end of 2015. We are currently using two Emblet X100 from Resmed and one PDX polysomnography machine from Philips. We also have facility for titration with CPAP and bi-level PAP. We perform in lab and home sleep study at present.

DR KRIPESH RANJAN SARMAH

KANAK HUZURI

The team consists of DR KRIPESH RANJAN SARMAH,MD,DNB,IBSM AND KANAK HUZURI (PT) SLEEP TECHNICIAN



Activities- we are regularly doing CME, workshop and public awareness camps among doctors and general population. We will conduct the 9th National Sleep Medicine Course on 5th and 6th December 2015.

Future plan-

1. To start sleep lab in Guwahti Medical College and Hospital with Alice 6 machine.

2. Training of doctor and technicians in sleep medicine

Incharge of Sleep lab: Dr Kripesh Ranjan Sarmah (visiting consultant)
Consultant Pulmonary, Critical Care and Sleep Medicine
Gauhati Medical College and Hospital
email id-kripeshdoc@gmail.com
Phone no- 91-8011000326

Dr Rajanish Sharma is one of the best doctors for all lungs, respiratory and chest problems. Dr Rajanish has an experience of more than 10 years in treatment of various problems related to respiratory and lung diseases like ILD, lung fibrosis, adult asthma, chest infection, bronchitis etc. Dr Rajanish Sharma is an expert in management and treatment of critical care patients in ICU.

Apart from a competent pulmonologist Dr Sharma is one of the best doctor for sleep disorder and specializes in sleep medicine. Dr Rajanish has trained in Sleep Medicine at jaslok hospital Mumbai and Indian Institute of Sleep Sciences, Mumbai and **later certified by 'World Sleep Federation' for specialist of Indian sleep Medicine.** Dr Rajanish Sharma has been associated with many hospitals in Jaipur and Rajasthan. He has been instrumental in setting up of ICU and sleep medicine departments at these hospitals. In all the sleep related disorder he treats, snoring problem and sleep apnea are the two most common problems that people seek his advice on. Dr Rajanish Sharma has done his graduation from JLN Medical college Ajmer, Rajasthan and specialization from Jaslok Hospital , Mumbai . He has been associated with SMS Medical College, Manu Hospital, R K Memorial Hospital and Rungta Hospital, Jaipur, Rajasthan in the past.

There are 84 known sleep disorders. They are silent, but they manifest in many ways. Common symptoms are daytime sleepiness, fatigue and attention deficit disorders. Patients have the symptoms, but their cause remains largely unknown. Sleep apnea, insomnia, restless leg syndrome are some examples of common sleep disorders. Untreated sleep disorders can have bad outcomes by way of serious medical illnesses like high blood pressure, diabetes, heart attacks and strokes. Sleep disorders exist silently with deadly complications. On a positive note, they are perfectly treatable!

Rudraksh sleep lab is located in a serene neighbourhood, away from the hustle and bustle of this lively city. Our location is easily accesible , yet very private. The lab feels like a home, quite unlike the hospital setting, where patients have to get 'admitted' for their sleep study. Our patients will have the luxury of coming to a 'home' for their sleep study.

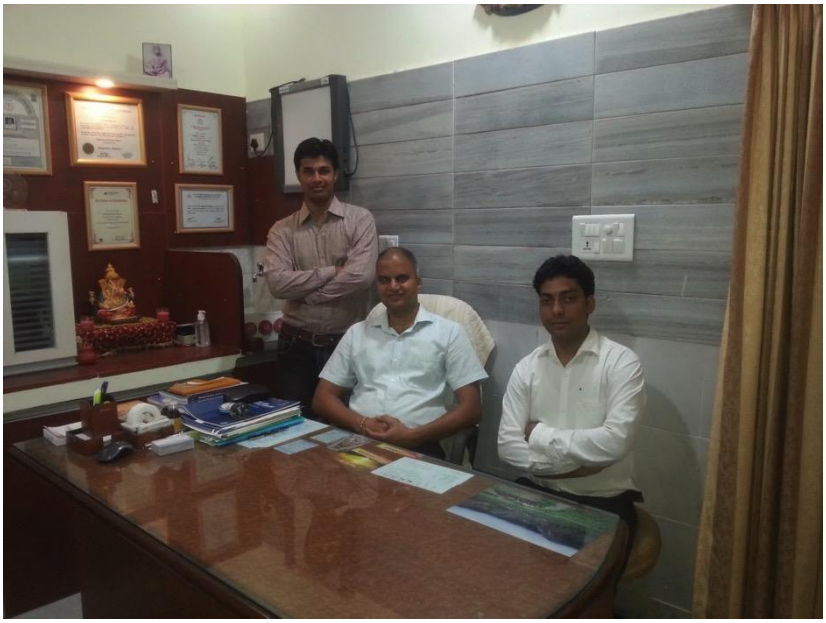
They will be studied in a comfortable and safe environment in a professional manner. We have tried hard to make their experience similar to going to bed at home.

Sleep study is performed here by well trained technicians , to be scored later by sleep expert according to AASM guidelines manually . On the contrary usually done automated scoring carries manypitfalls (chances of machine errors , event validation errors & multiple artifacts remains high) hencedeferred .

Followingtest are done in our sleep lab ;

- ✓ Diagnostic polysomnography
- ✓ CPAP/ BiPAP Titration polysomnography
- ✓ MSLT (Multiple sleep latency test)
- ✓ MWT (Maintenance of wakeful test)
- ✓ Synchronized viedeo PSG and QEEG / Neurofeedback

Our vision ;We startedthe lab to provide quality diagnostic workup of the patients , according to recommended standards of AASM. We wished to fill the lacunae in sleep disorders diagnosis andultimately specific therapeutic measures. In future we wish to promote our sleep laboratory as a training centre for the aspirant clinicians , technicians and also physiologists .



Team at Rudraksh Snore n Sleep Care, Jaipur, Rajasthan

Left to right : Mr Ankit , Dr Rajanish Sharma , Mr Vinod Jat

Publications from the lab

Obstructive Sleep Apnea

Oro-pharyngeal structures affect the sleep architecture in suspected OSA subjects. Nasal structures do not affect the sleep architecture in these subjects and enlarged tonsils have opposite effect. Sleep architecture changes on the titration night withCPAP.

P Singhal, R Gupta, R Sharma, P Mishra . Association of Naso-Oro-Pharyngeal Structures with the Sleep architecture in suspected Obstructive Sleep Apnea cases. Indian J Otolaryngol Head Neck Surg. 28 October 2011

For more details please contact-

Address:

Rudraksh Snore n Sleep Care
B-174, Meera Path
Near Vaishali Circle ,
Vaishali Nagar, Jaipur
Rajasthan -302021

Contact:

Dr Rajanish Sharma
Mobile no -9414752276
Rajanishsharma@yahoo.co.in

Personal experiences of Sleepwatcher

D. Sunil Kumar is presently working as a Remote Desktop Scorer for International Institute of Sleep, Florida. He has more than 5years of experience in different Sleep Centres across India. He is among the few Registered Polysomnography Technologists (RPSGT) in India.

A. Why did you choose to become a Sleep Technologist?

I always wanted to help people to lead a healthy and better life. I got a chance to do Bachelors in Pharmacy and I grabbed the chance with my aim in mind. After my graduation I heard about the field of Sleep Technology. I found it interesting, so I pursued this field. After gaining experience in the field of Sleep Technology I successfully cleared the examination given by Board of Polysomnography Technologists (BRPT) and became Registered Polysomnography Technologist (RPSGT). Now I help people to Sleep better.

B. What is the most challenging aspect of being a Sleep technologist?

There are several challenges for Sleep technologist in India-

- In the absence of any governing body the scope of the field in terms of opportunities is very limited
- In the absence of insurance coverage for sleep study and PAP devices the economic capacity to pay for sleep study is limited in Indian population.
- There is a need for a body that should bring all the Sleep Technologists under one roof in India and lay down the minimum educational requirement for hiring a Sleep technologist
- This field is more than just hooking up the patient. While hiring a Sleep Technologist attention should be paid to the educational background and Polysomnography skills.

C. What are the career opportunities for Sleep Technologists in India?

Currently the career opportunities are in hospitals, private sleep labs, and corporate sector or as a freelancer.

D. What is required to improve the quality of Sleep Technologists in India?

More training courses are required after which you can be certified as a Sleep Technologist. Recently I heard that SGT university, Haryana has started a certification course and more universities should bring courses like that to improve the field of Sleep Technology. The online sleep courses are very costly and not affordable by everyone.

Dr. Deepak Shrivastava trained at State University of New York and University of California, Davis. He received his sleep medicine training at Stanford. He is board certified in Sleep medicine, Pulmonary, Critical Care, Internal medicine and Polysomnography technology.

He is a Professor of Medicine, Sleep, Pulmonary and Critical Care. He is a senior faculty at Sleep Medicine Fellowship Program at UC Davis School of Medicine. He is recipient of many Academic and Service awards. He is also in clinical practice of sleep in California since 1989.

He is actively involved in leadership, political advocacy and sleep medicine training of healthcare providers in United States and abroad. He pioneered National Sleep Medicine Course in India with Dr. H N Mallick and full support of Dr. V. Mohan Kumar through ISSR. His FDA guided research in oral appliance therapy compliance monitoring is notable for a breakthrough technology.

Board Review Questions on Sleep Technology

1. All the listed findings are consistent with stage W in non-alpha generating individuals **EXCEPT:**

a. Eye blinks (0.5 to 2 Hz)
b. Rapid eye movements associated with normal or high chin muscle tone
c. Slow rolling eye movements
d. Reading eye movements

2. All of the following are 'required criteria' for scoring stage R (REM) **EXCEPT:**

a. Low-amplitude, mixed frequency (LAMF) EEG activity without K complexes or sleep spindles
b. Low chin EMG tone for the majority of the epoch and concurrent with REMs
c. Saw tooth waves
d. Rapid eye movements (REMs) at any position within the epoch

3. When scoring Periodic limb movements in sleep (PLMS) which of the following is **NOT** correct:

a. The minimum amplitude of a limb movement is an 8 uV increase in EMG voltage above resting EMG
b. The minimum period length between LMs to include them as part of a PLM series is 10 seconds
c. The maximum duration of a LM event is 10 seconds
d. Leg movements on 2 different legs separated by less than 5 seconds between movement on set are counted as a single movement.

4. Following Features are necessary to make a diagnosis of REM sleep behavior disorder **EXCEPT:**

a. Sustained muscle activity during REM sleep in the chin EMG
b. Excessive transient muscle activity during REM in the chin or limb EMG
c. Excessive transient muscle activity bursts are at least 4 times as high in amplitude as the background EMG activity
d. Diagnosis of RBD can be made based on polysomnographic findings only

5. Which one of the following is recommended maximum signal averaging time of pulse oximetry?

a. <3 seconds at a heart rate of 80 beats per minute

b. ≥3 seconds at a heart rate of 80 beats per minute

c. ≥ 5 seconds at a heart rate of 80 per minute

d. <0.5 seconds at a heart rate of 80 per minute

Note: For answers please refer to Page 55.

Board Review Questions on Sleep Medicine

1. A 28 year-old patient with hypersomnolence with an otherwise unremarkable sleep and medical history had a nocturnal polysomnogram which showed normal sleep without any sleep pathology: RDI < 2, PLM index < 5. Sleep logs showed a fairly regular sleep-wake schedule with 9 hours of time in bed per night. The patient had multiple sleep latency test (MSLT) the next day, in which the mean sleep latency was 7 minutes and there were 2 sleep onset rapid eye movement periods (SOREMPs). A urine drug screen in conjunction with the MSLT was negative. In addition to patient education, which of the following should be initiated?
    - clonazepam
    - ropinirole
    - modafinil
    - imipramine

2. A patient with restless legs syndrome being treated with carbidopa/levodopa 25 mg/100 mg at 10:00 p.m. develops restless leg symptoms at 4:00 a.m. This represents which one of the following clinical phenomenon?
    - augmentation
    - facilitation
    - dependence
    - dose response
    - rebound

3. K-complexes are typically present by what age following term birth?
    - 1-2 months
    - 3-4 months
    - 5-6 months
    - 12 months
    - 2 years

4. A 75-year-old-man complains of having had 1 year of insomnia. He goes to bed at 9:00 p.m., lies awake until 10:00 p.m., and then feels that he only dozes lightly and intermittently until falling more soundly asleep at 12:00 midnight. He wakes spontaneously at 5:00 a.m. and gets out of bed at 6:00 a.m. He does not nap during the day. He does not use alcohol, tobacco or caffeine, and his only medication is a morning diuretic for hypertension. There are no obvious physical illnesses to explain the problem. Which of the following is the most appropriate initial management?
    - light therapy at 8:00 p.m.
    - melatonin 3 mg at 10:00 p.m.
    - muscle relaxation therapy at 9:00 p.m.
    - sleep restriction therapy
    - zolpidem 5 mg at 8:00 p.m.

Note: For answers please refer to Page 55-57.

5. Which of the following variables has been demonstrated to be increased in insomnia patients in support of the hyperarousal theory of primary insomnia?
    - ○ eye movement density during REM sleep
    - ○ low frequency EEG activity during wakefulness
    - ○ metabolic rate (CO2 production)
    - ○ thyroid stimulating hormone levels

6. A 50 year old gentleman presents for evaluation of snoring and excessive daytime sleepiness (Epworth sleepiness scale = 16). During a split-night polysomnogram, the apnea-hypopnea index on the nocturnal sleep study is 45/hour; CPAP is initiated and titrated to 12 cmH_2O. On 12 cmH_2O, patient sleeps for 100 minutes (25 minutes REM sleep) and has an AHI of 3.5/hour.

   There were significant respiratory-related leg movements that resolved after the initiation of CPAP. On follow-up 2 months after initiating CPAP, patient states he feels his sleep is markedly improved but he remains sleepy during the day (Epworth Sleepiness Scale is now 14). Compliance monitoring indicates that the patient has used the CPAP 95% of nights for an average of 7 hours per night. Patient has no complaints of restless legs, cataplexy or sleep paralysis. Which of the following is the most appropriate step in management?
    - ○ initiate ropinirole
    - ○ initiate modafinil
    - ○ re-titrate CPAP
    - ○ perform MSLT

Board Review Questions on Sleep Technology Answers

1. c (Ref: page 19 AASM Scoring Manual Version 2.1)
2. c (Ref: page 24 I2. AASM Scoring Manual Version 2.1)
3. b (Ref: page 38 A2. AASM Scoring Manual Version 2.1)
4. d (Ref: page 40 F, Note 1. AASM Scoring Manual Version 2.1)
5. a (Ref: page 47 B7. AASM Scoring Manual Version 2.1)

Board Review Questions on Sleep Medicine Answers

1. Answer: modafinil

Because the patient meets ICSD-2 criteria for narcolepsy without cataplexy, a standard treatment protocol should be followed. Modafinil is considered a first-line treatment; behavioral measures such as napping have also demonstrated to be effective. Without evidence of cataplexy or any mitigating psychological disorders, an antidepressant would not necessarily be of benefit, and would be only a second choice. There is no evidence of restless legs requiring a dopaminergic agonist, and a benzodiazepine could exacerbate symptoms of excessive sleepiness.

Further Reading:

Young TJ, Silber MH. Hypersomnias of Central Origin. Chest 2006; 130:913-920.

Littner M, Johnson SF, McCall WV et al. Practice parameters for the treatment of narcolepsy: an update for 2000. Sleep 2001; 24:451-66.

2. Answer: rebound

Dopaminergic agents and carbidopa/levodopa have become the preferred treatment for both the restless legs syndrome (RLS) and for periodic limb movements in sleep (PLMS). For once-nightly treatments with carbidopal levodopa, a problem with morning end-of-dose rebound increases in leg movements has been reported to occur in the about one-fourth of the patients. In clinical studies a previously unreported but far more significant problem of markedly augmented restless leg symptoms occurred in the afternoon and the evening prior to taking the next nightly dose. A systematic prospective evaluation of this augmentation in 46 consecutive patients treated with carbidopal levodopa for RLS or PLMS disorder found this augmentation to be the major adverse effect of treatment. Augmentation occurred for 31% of PLMS patients and 82% of all RL patients. It was greater for subjects with more severe RL symptoms and for patients on higher doses (50/200 mg carbidopa/levodopa) but was unrelated to gender, age or baseline severity of PLMS. This augmentation was severe enough to require medication change for 50% of the RL patients and 13% of PLMS patients. Augmentation resolved with cessation of the medication and could be minimized by keeping the dose low.

Further reading:

Garcia-Borreguero D, Williams A: Dopaminergic augmentation of restless leg syndrome, Sleep Med Rev 14;339-346,2010

Rama AN, Kushida CA: Restless legs syndrome and Periodic iimb movement disorder, Med Clin **N** Am 88 (2004) 653-667

3. Answer: 5-6 months

Well-formed K complexes typically appear at 5-6 months of age. K complexes consist of a biphasic sharp, negative, high amplitude wave followed by a moderate to high amplitude longer duration negative wave. Although there are no voltage criteria, K complexes often exceed 200 uV and must be at least 0.5 s in duration. K complexes, along with sleep spindles, mark stage 2 NREM sleep and can be elicited by auditory or other stimuli.

Further Reading:

Sheldon SH, Kryger M, Ferber R. Principles and Practice of Pediatric Sleep Medicine. Philadelphia: Elsevier; 2005.

Fisch BJ. Fisch and Spehlmann's EEG Primer. Philadelphia: Elsevier; 1999.

4. Answer: sleep restriction therapy

Some insomnia sufferers attempt to alleviate their sleep disturbances by spending excessive time in bed; however, allotting too much time for sleep fragments the sleep pattern and creates excessive time awake each night. By restricting time in bed a mild sleep deprivation is induced. As a result, sleep drive is increased, wakefulness is reduced and the sleep pattern is consolidated. In this patient, sleep and wake times are normal for age arguing against a circadian disorder. Muscle relaxants often induce daytime somnolence the next day and have not been shown to have sleep induction effects. Behavioral approaches should generally be attempted before utilizing a medication such as zolpidem particularly in a situation where no daytime adverse effects are noted for the patient's complaint of "insomnia."

Further Reading:

Means, M. K., and Edinger, J.E. (2006) Nonpharmacologic therapy of insomnia. In Sleep. A Comprehensive Handbook (Lee-Chiong, T., ed), John Wiley and Sons, Hoboken N.J.Pagel, J. F., and Pandi-Perumal, S. R. (2007) Primary Care Sleep Medicine, Humana Press, Totowa, NJ

5. Answer: metabolic rate (CO_2 production)

Individuals with chronic insomnia have been shown to have an increased metabolic rate, increased heart rate variability, increased beta activity in the sleep EEG, increased secretion of ACTH and increased daytime alertness despite short sleep. It is unclear as to whether this hyperarousal itself is a cause or consequence of insomnia but the hyperarousal theory of primary insomnia postulates that the insomnia is the nighttime of an overall increased arousal state.

Further Reading:

Stepanski, E. (2006) Causes of insomnia. In Sleep: A Comprehensive Handbook (Lee-Chiong, T., ed), John Wiley and Sons, Hoboken, N.J.

Perlis, M. L., Smith, M. T., and Pigeon, W. R. (2005) Etiology and pathophysiology of insomnia. In Principles and Practice of Sleep Medicine, 4th Edition (Kryger, M., Roth, T., and Dement, W., eds), W.B. Sanduers, Philadelphia

6. Answer: initiate modafinil

The patient presents with residual daytime sleepiness despite treatment for his underlying sleep apnea. Modafinil is indicated if the following criteria are met: Epworth sleepiness scale ≥10; adequate CPAP titration (AHI on prescribed pressure <5-10/hr), objectively confirmed good CPAP compliance (variably defined, but minimum would be ≥4 hours per night, ≥5 nights per week); adequate sleep hygiene and hours slept; no potential medication side effects (for instance, over the counter antihistamine); and no evidence of another sleep disorder. In this example, there is no evidence presented for restless leg syndrome or periodic limb movement disorder. These disorders frequently co-exist with OSA and can be unmasked by CPAP treatment; if present, a dopamine agonist such as ropinirole or pramiprexole would be indicated. There is no indication for a repeat titration as the CPAP titration was recent and adequate and there has been no change in weight. MSLT would be indicated only if a diagnosis of narcolepsy was suspected.

Further Reading:

Pack, A. I., Black, J.E., Shwartz, J.R., and Matheson, J.K. (2001). Modafinil as adjunct therapy for daytime sleepiness in obstructive sleep apnea. AM J Respir Crit Care Med 164, 1675-1681

Black, L.E., and Hirshkowitz, M. (2005) Modafinil for treatment of residual excessive sleepiness in nasal continuous positive airway pressure-treatment obstructive sleep apnea/hypopnea syndrome," Sleep, Vol. 28, No. 4. 464-471.

ISSR Membership

The Indian Society of Sleep Research (ISSR) works to protect sleep health and promote high quality patient care. These goals are dependent on the support of the professionals working in the field. Membership with the ISSR funds the activities executed for the benefit of all who practice sleep medicine or conduct sleep research.

The ISSR works to improve sleep health through advocacy, education, strategic research and practice standards. Issue 1of the *ISSR Newsletter* describes some of the new initiatives that are helping to achieve this goal.

The Society will have Life members, Regular members and Corresponding members. In addition to membership the members will receive subscription to-

1. Journal of Sleep and Biological Rhythm
2. ISSR News letter
3. ISSR Literature Updates

We encourage you to become member of ISSR and members to renew their membership so that we have your support in continuation of the field of Sleep Medicine.

For more details on membership please visit www.issr.in

Professional Sleep Societies and Web links

American Academy of Sleep Medicine (AASM)	www.aasmnet.org
American Association of Sleep Technologist (AAST)	www.aastweb.org
American Board of Sleep Medicine (ABSM)	www.absm.org
World Association of Sleep Medicine (WASM)	www.wasmonline.org
World Sleep Federation (WSF)	www.worldsleepfederation.org
European Sleep Research Society (ESRS)	www.esrs.eu
Australasian Sleep Association	www.sleep.org.au
Asian Sleep Research Society (ASRS)	www.asrsonline.org
Indian Sleep Disorder Association (ISDA)	www.isda.co.in
Indian Society of Sleep Research (ISSR)	www.issr.in
Board of Registered Polysomnography Technologists (BRPT)	www.brpt.org

Letter to the Editor:

Dr. Tripat Deep Singh
MBBS, MD(Physiology), RPSGT, RST
International Sleep Specialist
(World Sleep Federation Program)

Our readers are invited to write to the editor regarding their views on the published material and also to contribute interesting content or updates in the field.

Email us on sleepwatching@yahoo.com.sg