

# Abstracts of Goasleep2017 - The International Conference on Sleep Medicine and Research, Goa, 22nd and 23rd September 2017

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### PLENARY LECTURE ABSTRACTS

#### ABSTRACT 1

##### Gaseous Messenger Molecules and Sleep Apnea

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Sleep apnea, which is the periodic cessation of breathing during sleep, is a major health problem affecting over millions of people and is associated with several pathological sequelae including hypertension and stroke. Clinical studies suggest that abnormal carotid body (CB) activity may be a driver of sleep apnea. As gaseous molecules are important determinants of CB activity, aberrations in their signaling could lead to sleep apnea. We tested this possibility in mice deficient in heme oxygenase-2 (HO-2), which generates the gaseous molecule carbon monoxide (CO). A majority (75%) of the HO-2<sup>-/-</sup> mice displayed frequent apnea of equal or greater than 20 events per hour, whereas only 5% of the WT mice exhibited such common apnea. Likewise, 56% of the HO-2<sup>-/-</sup> mice had a hypopnea (breathing event

with  $\geq 30\%$  reduction in tidal volume) index greater than 80. In contrast, only 2.5% of the WT mice displayed a similar hypopnea index. Incidence of apneas and hyponeas was high during sleep as identified by electroencephalography. HO-2<sup>-/-</sup> mice had both obstructive and central sleep apnea, and the incidence of former was greater than the latter. We identified the gaseous molecule hydrogen sulfide (H<sub>2</sub>S), as the major effector molecule driving apneas. Genetic ablation of the H<sub>2</sub>S-synthesizing enzyme cystathionine- $\gamma$ -lyase (CSE) normalized breathing in HO-2<sup>-/-</sup> mice. Pharmacologic inhibition of CSE with L-propargyl glycine prevented apneas in both HO-2<sup>-/-</sup> mice and SH rats. These observations demonstrate that dysregulated CO and H<sub>2</sub>S signaling in the CB lead to apneas and suggest that CSE inhibition may be a useful therapeutic intervention for preventing CB-driven sleep apnea (Supported by NIH-UH3-HL90554 and PO1-HL90554).

#### ABSTRACT 2

##### The Impact of Sleep Deprivation on Memory Storage

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<sup>1</sup>*Director, Iowa Neuroscience Institute, Professor, Departments of Molecular Physiology and Biophysics, Psychiatry, and Biochemistry*

Millions of people regularly obtain insufficient sleep. Therefore, understanding the cellular and molecular pathways affected by sleep deprivation is of great social and clinical importance. Sleep facilitates the formation of hippocampus-dependent memories and brief periods of sleep deprivation are detrimental to memory consolidation. Additionally, sleep is regulated by many of the same molecular processes that contribute to memory storage. The Abel lab uses a combination of molecular, genetic, and viral approaches to elucidate the mechanisms underlying the impact of sleep deprivation long-term memory consolidation. Specifically, we have found sleep deprivation induces a cascade of changes in cAMP signaling, protein synthesis and changes in the actin cytoskeleton and dendritic spines. These molecular and cellular effects of sleep deprivation led to deficits in memory storage and synaptic plasticity. By manipulating these molecular pathways, we have been able to reverse the memory deficits caused by sleep deprivation.

**ABSTRACT 3****Sleep and Circadian Clock—a Novel Perspective**Ken-ichi Honma<sup>1</sup><sup>1</sup>*Professor Emeritus, Hokkaido University, Sapporo Japan*

Humans show unique sleep–wake cycles such as internal desynchronization, circadian (ca. 48 h) rhythm and non-photic entrainment which are not explained by the photosensitive circadian pacemaker located in the suprachiasmatic nucleus (SCN). Consolidated sleep and wakefulness is also a unique feature of humans. Based on these findings, a two oscillator model has been advanced: one is the SCN circadian pacemaker and the other an unidentified oscillator(s) responsible for the sleep/wake cycle.

Rats and mice treated with methamphetamine (MAP), a central stimulant, in drinking water show consolidated sleep and wakefulness which exhibit a robust oscillation in a circadian range and desynchronize from the circadian rhythms in the SCN. The oscillation is not entrained by a light–dark cycle, but entrained by non-photic time cues such as restricted daily feeding. The oscillation occasionally shows circadian period. We call it as the MAP-induced oscillation (MAO).

Taking advantage of a bioluminescent reporter of a clock gene *Per2*, circadian *Per2* rhythms in the brain dopaminergic system were monitored in a cultured slice from MAP-treated rats. They exhibited completely different features from those of the control animals. Thus, the MAO is concluded to be a complex oscillator composed of multiple circadian oscillators in extra-SCN regions and directly regulates a sleep/wake cycle.

**SYMPOSIA ABSTRACTS****ABSTRACT 1****Neonatal Sleep in Normal and Prenatal Stress Conditions**Kamalesh K Gulia<sup>1</sup><sup>1</sup>*Division of Sleep Research, Sree Chitra Tirunal Institute for Medical Sciences and Technology, tel:9048344712;**Mail:kkguliak@hotmail.com*

Sleep in fetus and neonates of altricial species undergo age-specific changes which are indicative of developmental milestones. Moreover, maternal sleep is marked by reduced quality especially during last trimester of pregnancy even during normal pregnancy. Further disruptions in sleep during pregnancy adversely affect the neuropsychological development of the offspring that is illustrated by strictly controlled animal experiments. Sleep deprivation during late pregnancy adversely affects fetal neural networks evident from depression like symptoms and expression of hyperactivity and increased risk-taking behaviour during adolescence. Litters born to sleep deprived dams had lower body weights at birth. The ontogenetic profiles of sleep–wakefulness in these neonates provided further evidences for an altered neural development. Newborns of rapid eye movement sleep deprived dams had higher percentage of active sleep (AS) from postnatal days 1–21, and reduced latency to AS during day 15 and 21. Sleep–wake cycles of lesser frequency and longer duration in comparison to control pups indicated maturational delay in the sleep–wake neural networks. The changes in sleep–wakefulness during initial development in the neonates from other prenatally stressed conditions are compared. Examination of altered sleep–wake patterns during early postnatal window may provide crucial information about abnormal neural development in the offspring.

**ABSTRACT 2****Emerging Need for Understanding Sleep During Development**V. Mohan Kumar<sup>1</sup><sup>1</sup>*Former Professor and Head, Dept of Physiology, AIIMS, N.Delhi, and Emeritus Scientist of CSIR and ICMR, tel:09446058004; Mail:wfsrs2005@rediffmail.com*

Optimal sleep is essential for normal growth and development, not only for neonate, but probably also for the foetus inside the womb of the mother. Apart from some animal studies, most information about human foetal sleep is based on recordings from preterm neonates. Unlike the emphasis on EEG for scoring sleep in adults, the sleep stages in the newborn are heavily dependent on sleep behaviours and respiratory rates.

Neonates spent a large amount of time in active sleep (AS) which is the equivalent of REM sleep in adults. At birth, the circadian rhythm is not fully developed, but the ultradian rhythm which is established even during intra uterine life, produces polycyclic pattern of sleep during the day and night. Full term babies sleep 10.5–18 h a day, with sleep periods lasting for a few minutes to several hours.

Social and developmental issues start affecting sleep by the second half of the first year. Toddlers' drive for independence and an increase in their motor, cognitive and social abilities, separation anxiety, their ability to get out of bed, the need for autonomy and the development of the child's imagination can interfere with sleep when they reach about 18 months of age. School-aged children become more interested in TV, computers, media, internet, as well as caffeine products. All of them can lead to disruptions of sleep. Poor or inadequate sleep can lead to mood swings, behavioural and cognitive problems that impact on their ability to learn in school.

**ABSTRACT 3****Hypersomnia in Adolescents**Preeti Devnani<sup>1</sup><sup>1</sup>*Clinical Director, Sleep Disorders Clinic*

Hypersomnia or excessive daytime sleepiness (EDS) in the adolescents can be of a medical and/or psychosocial etiology. The term 'hypersomnolence' refers to the symptom of excessive sleepiness, whereas hypersomnia indicates specific disorders, such as idiopathic hypersomnia. The ICSD-3 defines hypersomnia as "the primary complaint of daytime sleepiness not caused by disturbed nocturnal sleep or misaligned circadian rhythms."

When assessing the "Sleepy Teenager" we need to differentiate between normal physiological changes and pathological conditions. Medical investigations, differential diagnoses as well as appropriate diagnostic tools help decode this complex behavioural pattern.

The physiological tendency towards later bedtimes resulting from maturational changes in conjunction with societal peer pressure compound the issue of insufficient sleep resulting in chronic sleep deprivation. In addition, the use of computers, social media and 24 h connectivity plays a profound role. Misalignment of the circadian rhythm and sleep deprivation can have several health implications and can predispose towards mood disorders.

Sleep disorders that either result in inefficient sleep such as Obstructive Sleep Apnea or Hypersomnia associated sleep disorders are important to identify and the role of parents, care-givers, teachers, and pediatricians in detecting them is crucial.

Central disorders of hypersomnolence are classified as follows:

- Narcolepsy type 1
- Narcolepsy type 2
- Idiopathic hypersomnia
- Kleine–Levin syndrome
- Hypersomnia due to a medical disorder
- Hypersomnia due to a medication or substance
- Hypersomnia associated with a psychiatric disorder
- Insufficient sleep syndrome
- Isolated symptoms and normal variants

Subjective tests like Epworth Sleepiness scale, sleep logs and actigraphy can help determine EDS severity and understand the rhythm. Multiple Sleep Latency test is a diagnostic tool that assesses the severity of EDS and can help determine if Narcolepsy/Idiopathic hypersomnia is the etiology. Mean Wakefulness test is appropriate to assess response to treatment.

#### ABSTRACT 4

##### The Role of Adult-Born Neurons in Memory Consolidation During Sleep

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Sleep exerts significant effects on hippocampal activities that are important for memory consolidation. Mammalian sleep contains rapid eye movements (REM) and non-REM sleep, both could employ different mechanisms for memory consolidation. Previous reports showed that memory-associated odor stimulation during non-REM sleep enhanced hippocampus-dependent memory consolidation. In addition, inhibiting sharp wave-ripples in the hippocampus during non-REM sleep interfered with memory consolidation. On the other hand, inhibiting theta wave in the hippocampus during REM sleep interfered with memory consolidation. However, the memory circuit that is responsible for memory consolidation during each sleep stage has not been clearly shown. We have shown that hippocampal adult-born neurons are incorporated into memory circuits after learning. Therefore, we silenced the activities of the adult-born neurons during specific stages of sleep after learning using optogenetics, which provides reversibility in intervention with higher time resolution and target specificity. The intervention revealed that the activities of the adult-born neurons are necessary for memory consolidation during a specific stage of sleep.

#### ABSTRACT 5

##### Sleep and Anxiety Disorders

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Sleep is an important behavioral state responsible for maintaining homeostasis in healthy individuals. Studies have shown that about one-third of insomniacs evaluated at sleep centers had a primary psychiatric

diagnosis and another 40% had a secondary psychiatric diagnosis. Though sleep disturbance is considerably associated with psychiatric illness but they lacked absolute specificity of particular sleep variable to a specific psychiatric disorder. Community based study have shown that 40% of patients with complaints of insomnia have a mood or an anxiety disorder. Despite the prominent sleep complaints it has historically been the sleep of patients with affective disorders that has received the primary focus of research attention, relatively little research has been focused on sleep disturbance in anxiety disorders.

Insomnia and anxiety disorders are intimately connected. Insomnia occurred with anxiety disorders at same time in 39% of patients, occurred after anxiety disorders in 44% and anxiety prior to insomnia was in 73% of adults. Among Generalized Anxiety Disorder (GAD) patients, 60–70% complaint of ‘trouble sleeping’. The sleep disturbance is trouble in falling sleep and staying asleep, increased daytime fatigue, irritability, and difficulty in coping. The sleep disturbance associated with mild to moderate GAD is a sleep maintenance insomnia and to a lesser extent a sleep onset insomnia. Polysomnographic studies in GAD patients have shown increased sleep latencies, intermittent wakefulness, and decreased sleep efficiency in addition to changes in sleep architecture like reduced slow wave sleep and REM sleep. Increase in stage I sleep, decrease in stage II, decreased REM duration and REM latency are also reported. There are also reports of negative findings in REM sleep and sleep architecture, without showing any aberration.

Insomnia is associated with social phobia. Study on subjective assessment of sleep in Social phobia has showed that it is associated with poor sleep quality, longer sleep latency, frequent awakenings and daytime dysfunction. However, Polysomnographic studies were similar to that of healthy controls.

However our study (unpublished) viewing sleep of GAD patients in co morbidity like social phobia showed reduction in NREM stage 2 sleep and increase in REM sleep, total wake time, wake after sleep onset. Suggesting disturbances in sleep continuity and poor quality of sleep. Possible mechanisms for sleep changes in anxiety disorders include neurotransmitter imbalance (GABA and serotonin imbalance), circadian phase advance, and hypothalamic-pituitary adrenal axis dysregulation, increased metabolism in emotional pathways may increase emotional arousal and thereby adversely affect sleep.

Intervention with Manasamitra vataka (Ayurveda Medicine) and shirodhara (Oil dripping Ayurveda procedure on forehead) in patients of GAD with social phobia showed anxiolytic activity comparable to clonazepam with additional benefit of preserving slow wave sleep and promoting sleep quality in patients (Tubaki et al. 2016).

#### ABSTRACT 6

##### Sleep and Schizophrenia

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Schizophrenia is a devastating mental disorder whose pan-cerebral involvement eludes many diagnostic investigations. In this regard, sleep is a unique brain state where confounds of waking cognition—such as attention, motivation and comprehension—are diminished and offers a window into the aberrant synchrony of a schizophrenia brain. As with other mental disorders, studies using whole night polysomnography have reported various parameters suggesting impaired sleep initiation and maintenance among patients with schizophrenia. However, these measures were inferred by averaging the sleep stage parameters that span over a 5- to 7-h sleep period.

As sleep is a self-organising dynamic state with bouts of shorter periods called sleep-cycles, the derangements and compensations that may be limited to such sleep-cycles may have been missed in the earlier studies. Moreover, some studies have also found consistent abnormality in a sleep-associated EEG oscillation—sleep-spindle—adding further evidence to the ‘thalamo-cortical dysfunction hypothesis’ in schizophrenia.

Accordingly, we examined sleep stage changes and spindle-delta dynamics across sleep-cycles among 45 patients with schizophrenia and 39 age-gender-matched healthy control subjects. Besides replicating previous reports of macro- and micro-sleep-architectural abnormalities among patients, we also found awakenings more in first and third sleep-cycles. Specifically, NREM period of patients was more vulnerable to disruption in first cycle and REM period during second cycle. Interestingly, sleep-spindles that showed a whole sleep deficit in patients with schizophrenia, were positively correlated with sleep disruption during the subsequent REM period. Thus, our results highlight a possible maladaptive interplay between unstable thalamo-cortical networks, resulting in sleep-cycle-specific instability patterns that may be unique to schizophrenia pathophysiology.

## ABSTRACT 7

### Epidemiology and Evaluation of Excessive Daytime Sleepiness (EDS)

Dr. Debanjan<sup>1</sup>

<sup>1</sup>*Department of Psychiatry, NIMHANS, Bangalore*

Although substantial proportion of general population experiences sleepiness, the reported prevalence figures of EDS, varies widely. Comprehensive population based data from the western world places the prevalence rate of substantial EDS at around 15% of the studied population, whereas 25–30% of the psychiatrically ill patients are reported to have EDS. Considering the gross under-diagnosis of EDS in daily population, the actual number would be quite higher. In India, there has been a real dearth of research in this regard and lesser is known about the different cause-based prevalence rates.

All forms of sleepiness are not EDS. Considering how debilitating this condition can be and its profound effect on family and social life, early evaluation and diagnosis is highly warranted. Although there is no match for a detailed and tailored medical history, several objective questionnaires (ex: Epworth Sleepiness Scale, etc.), laboratory based tests like polysomnography (PSG) and multiple sleep latency test (MSLT) highly aid the clinician’s eye in this regard.

Focusing on the above two constructs, in this section we shall glance through the statistics of EDS to its assessment and tools of evaluation.

## ABSTRACT 8

### Syndromes of Excessive Daytime Sleepiness (EDS)

Dr. Soumitro Das<sup>1</sup>

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Excessive daytime sleepiness (EDS) is characterized by persistent sleepiness and often general lack of energy even after adequate or even prolonged nighttime sleep. However it is a symptom complex and not a primary disease in itself. More accurately, it can be considered as a broad condition encompassing several sleep disorders or syndromes. The causes can be multi-factorial ranging from genetic to vitamin deficiencies to simple lack of sleep to primary EDS related disorders.

Whatever the disorder might be, the symptom dimensions of EDS can occur due to the following reasons: inadequate sleep; circadian influences; fragmented sleep architecture. Keeping this in background, we shall discuss the following EDS related disorders grouped as below:

1. Sleep related breathing disorders (Obstructive sleep apnea syndrome, Upper airway resistance syndrome, Central sleep apnea syndrome)
2. Sleep related movement disorders (Periodic limb movement disorder, Restless leg syndrome)
3. Primary disorders of EDS (Special focus on Narcolepsy and various types of hypersomnias)

While discussing this section, we shall also highlight the key clinical differences in each of these conditions which shall ready us for the subsequent sections on differentials and management of EDS.

## ABSTRACT 9

### Psychiatric Disorders and Medications: Bidirectional Relationship with Excessive Daytime Sleepiness (EDS)

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Psychiatric illness, especially depression, has been thought to have significant relation with excessive daytime sleepiness (EDS) in patients. Not only EDS is common in patients of depression, somatoform disorders and chronic fatigue syndrome but also EDS in itself has also been shown to enhance the risk of depression in vulnerable depression. In fact, sleep-deprivation has been postulated as one of the definitive though temporary methods of treating deprivation. Besides symptoms of mental fatigue, tiredness and decreased concentration can well overlap with the residual effects of EDS and often teasing them out separately might be difficult as well as critical.

At the same time, psychiatric medications prescribed or over-the-counter have been notorious for both sleep induction and deprivation. Either as a side-effect to their hypnotic property or rebound phenomenon for their wakefulness-promotion, they can contribute to EDS in their own way. Most common in this regard are the anti-depressants, anti-psychotics, anti-epileptics as well as other medications like alpha-agonists, calcium channel antagonists and beta-blockers. Co-morbidity being the usual rule, it’s vital that the clinician stays sensitized to the effect of these medications or else their role might be missed out leading to over-diagnosis and unwanted prescriptions.

Hence, in this section we shall predominantly be dealing with:

1. Helping the audience to appreciate the common overlap between EDS and mental disorders: necessary steps to be taken
2. Confounding effect of psychiatric medications on EDS.

## ABSTRACT 10

### Restless Leg Syndrome in Children

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<sup>1</sup>*Director, Clinical Pulmonary Medicine, San Joaquin General Hospital and Senior faculty in sleep medicine fellowship program at University of California, Davis, USA*

Restless legs syndrome (RLS) is believed to be primarily an autosomal dominant motor disorder characterized by an uncontrollable

movement of legs which usually results in partial or complete resolution immediately, albeit transiently. The common causes of secondary RLS in children appear to be iron deficiency, peripheral neuropathy and uremia. The diagnosis of this disorder depends on subjective complaints. This poses a problem, especially in children.

Children with RLS can present with conduct problems including aggression, inattention, hyperactivity, and daytime somnolence because of an inability to sleep or difficulty maintaining sleep. These symptoms may result from an associated periodic limb movement disorder (PLMD) or other problems such as aches and pains.

The four essential diagnostic criteria for adults are (a) Urge to move legs caused by uncomfortable sensation in them, (b) An urge to move that begins or worsens during rest (c) The sensations only occur during the evening or night and (d) These sensations are relieved by movement of the body. If the child meets all 4 essential adult criteria for RLS and describes the sensations in his or her own words, it is considered a diagnosis of *definite* childhood RLS. If the description is lacking, but the child's family has a history of definite RLS (biological parent or sibling only), it is a diagnosis of probable childhood RLS.

Typically, RLS follows a circadian pattern, usually occurring in the evening or night but, rarely, at other times during the day. Children can be especially "restless" in restrictive situations. Emotional social interactions also can thwart or alleviate the restless symptoms. RLS-related pain in children typically occurs from both knees down and especially involves the calves.

Central dopaminergic systems are involved to some extent in the pathogenesis of RLS as it improves its symptoms. The US Food and Drug Administration has approved no medications for RLS in children. Clonidine and clonazepam have been studied and both are fairly well tolerated. The best initial form of treatment is to reduce factors or conditions that may worsen RLS. No guidelines have been formulated for treating iron deficiency in children with RLS. Thus, iron supplementation should be implemented with caution. Good sleep hygiene practices can be helpful for children with RLS.

The diagnosis and treatment of RLS in children is often challenging. If it is not treated, RLS in children can result in serious behavioral consequences, including impaired daytime functioning, poor school performance, etc. Factors or conditions that may worsen or precipitate RLS in children have yet to be explored. Pediatricians should be aware that this condition can be accurately diagnosed by obtaining a thorough history, and that treatment, though limited at this point, can reduce the symptoms of this common disorder.

## ABSTRACT 11

### Orexin Increases Motivation and Locomotor Activity During Sexual Behavior in Rats

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The discovery of the orexin around the turn of last century has given new direction to sleep-wakefulness research. Orexin-A (OX1) and orexin-B (OX2) the two neuropeptides are densely located at the lateral hypothalamic area. Surprisingly, these neurons have widespread connection with the wake promoting areas in the brain. With its connection with the locus coeruleus (LC) noradrenergic system, orexin regulates vigilance, attention, learning, and memory. The

'fight-or-flight' phenomenon is a highly motivated behavioral response which demands tremendous motor activity. There is heightened sympathetic activation with the release of noradrenaline during this response. Male sexual behaviour in rats involves motivation and intense motor activity. We utilized this model to study the role of orexin to study locomotor activity (LMA) and associated arousal.

Medial preoptic area is known to be involved in control of sexual arousal as well as performance. Local injections of orexin A (Hypocretin-1) at the medial preoptic area increased sexual arousal as well as copulatory performance indicating its role in motivation.

Effects of intracerebroventricular (ICV) administration of the OX1R antagonists (SB-334867) and novel dual receptor antagonist suvorexant was studied on the LMA of mounter rats. The LMA were recorded telemetrically during pursuit of estrous and non estrous female for copulation.

Significant reduction of LMA during sexual activity was observed after ICV injection of SB-334867 and suvorexant when compared to basal and vehicle reading.

Based on these results we propose that orexin does play a role in boosting locomotor activity during motivated behavior.

## ABSTRACT 12

### The Physiological Role of Orexinergic Neurons in the Regulation of Sleep/Wakefulness, Pain And Metabolism

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Neuropeptide "Orexin/hypocretin" is produced in the small number of neurons (orexin neurons) exclusively located in the lateral hypothalamus. These neurons project throughout the brain and dense innervation is observed in the nuclei which are thought to be the wake center. Sleep disorder Narcolepsy is caused by specific degeneration of these neurons suggests its important role in the regulation of sleep/wakefulness, especially in the maintenance of wakefulness. To reveal physiological role of orexin neurons, manipulation of neural activity technique such as optogenetics or pharmacogenetics was applied.

Optogenetics and pharmacogenetics enables control the activity of targeted neurons in vitro and in vivo with very high spatial and temporal resolution. Activation or inhibition of orexin neurons using these techniques increased or decreased time in wakefulness, respectively. In addition to the effect on sleep/wakefulness, activation of orexin neurons increased spontaneous locomotor activity, metabolism, drinking and feeding behavior and threshold to pain induced by mechanical and chemical stimulation. These results suggest that orexin neurons are involved in variety of physiological responses. The next, we measured activity of orexin neurons using fiber photometry in freely moving mice. Orexin-Cre mice in which orexin neurons express Cre recombinase were injected adeno-associated virus (AAV) which express calcium indicator, GCaMP6 in the presence of Cre recombinase. Fiber optics was inserted into the hypothalamus and measured the activity of orexin neurons by measuring light intensity of fluorescent from GCaMP6. Mechanical pinch stimulation more than 300 g or heat exposure more than 50° to the tail induced increase in activity of orexin neurons and aversive response. These results suggest the activity of orexin neurons induced aversive response by increasing level of wakefulness and decreased pain.

**ABSTRACT 13****Chronic Orexin Receptor Blockage by Suvorexant Induces Cataplectic Behavior by Reducing Orexin Peptide Synthesis in Mice**

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Orexins/hypocretins are key neuropeptides responsible for regulating central arousal and reward circuits. Additionally, disruption of orexin signaling leads to narcolepsy in humans, and in animal models. Despite this fact, orexin receptor (OxR) antagonist, suvorexant, has been approved for human use to treat insomnia. We hypothesize that chronic OxR blockage can down-regulate the orexin system to mimic orexin-KO condition.

Results showed that chronic suvorexant treatment, instigate cataplexy and sleep-onset REM (SOREM) sleep in mice. REM and NREM sleep increased acutely, however, the effect was gradually diminished during chronic suvorexant administration. Further experiments showed that suvorexant inhibited the synthesis of orexin, but increased the expression of OX2R during chronic suvorexant treatment. These data imply that chronic OxR blockage leads to reduced orexin peptide synthesis that results in cataplectic behavior in mice.

This study warrants cautious use of suvorexant as insomnia therapy. Further, we developed and established a novel therapy for the treatment of narcolepsy. In this therapy orexin was infused intrathecally into the mice brain, that was manifested by CT-scan analysis and radio-immuno assay. Moreover, slow infusion of orexin into the brain via intrathecal catheter in mouse model of narcolepsy, decreased SOREM and cataplexy. In conclusion, we propose intrathecal orexin delivery as a potential therapy for narcoleptic patients.

**ABSTRACT 14****Serotonin Neurons of the Dorsal Raphe Mediate the Anti-Cataplectic Action of a Sleep Disorder Narcolepsy**

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**Objectives:** Although the neurodegeneration of orexin (hypocretin)-producing neurons causes the sleep disorder narcolepsy, the precise neural mechanisms by which orexin neurons prevent narcolepsy remain unclear. We previously demonstrated that orexin neurons inhibit cataplexy via serotonin (5HT) neurons in the dorsal raphe

nucleus (DRN). As next stage, we used optogenetic and chemogenetic approaches to demonstrate that DRN-5HT neurons suppress cataplexy.

**Methods:** The 12- to 20-week-old male mice (Orexin-ataxin3, Ox1r<sup>-/-</sup>Ox2r<sup>-/-</sup>, and Sert-Cre) were used. Implantation of an EEG/EMG electrode, optic fiber, and stereotaxic injection of AAV vectors were performed. For optogenetic experiments, mice were given milk chocolate along with their regular chow. The CNO or saline was administered to each mouse intraperitoneally at ZT12 without chocolate feeding. We measured the 5HT release in slices by using electrophysiological recording and HPLC.

**Results:** We aimed to identify the Amygdala as downstream target that mediates the anticataplectic effects of DRN-5HT neurons.

**Conclusions:** Our study provides additional support for our previous observations that DRN-5HT neurons mediate the anticataplectic function of orexin neurons (Hasegawa et al. 2014). Both studies propose the orexin neuron–DRN 5HT neuron–amygdala pathway as a critical circuit to prevent cataplexy.

**ABSTRACT 15****Advances in EEG-Based Sleep Detection**

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EEG-based sleep study or Polysomnography continues to be the gold-standard to investigate sleep disorders, and has gained momentum in recent years with better availability of sleep labs and greater awareness of such disorders. However, the starting point for report generation, is sleep stage classification, and is largely based on visual inspection—a difficult, tedious and time-consuming task. This is despite the availability of several automated sleep scoring software. Sleep research is a critical area at Axxonet and we are working on advancements in automated EEG-based sleep classification.

To improve the accuracy of automated sleep stage detection we have also incorporated techniques that are actively and passively employed by expert scorers. For instance, manual scoring involves a multi-step iterative stage detection sequence. Conventional sleep stage classification uses discrete (often 30 s long) epochs grouped into a limited number of sleep stages, while we have embraced the more continuous measures of sleep staging in the temporal and spatial domain, where measures such as time–frequency parameters and scalp topography connectivity are also taken into consideration. This helps compute novel sleep EEG-based parameters that can complement conventional measures and make sleep reports more informative for clinical use.

We are also working on a fast and accurate real-time sleep stage detection system that can be used to trigger stimulus delivery devices (e.g. audio), neuromodulation devices or other medical devices to aid in time-critical interventions during sleep.

**ABSTRACT 16****Research and Development of Hardware for Sleep Research**

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Various advances in sensors, acquisition devices, signal processing have resulted in improvements and advances of sleep systems which would have been sci-fi a few years ago.

We have a dedicated research and development team who are continuously working on advancement in hardware and software for various electrophysiological measures including EEG/ERP/PSG.

One of our work in this field involves the development of stimulus driven sleep studies. ERP in sleep is one such development in which our team have been actively working on. This involves the ability of our hardware/software devices to be able to give out auditory/visual stimulus based on the sleep stage that subject is on. The stimulus can be targeted to a particular sleep stage based on the online sleep scoring that is being developed.

We have also developed small ERP trigger devices which could enable conventional sleep machine to have basic ERP capabilities. This device sends trigger to conventional sleep system from an independent stimulus program.

Our work with transcranial alternating current stimulation (tACS) in sleep has also been very encouraging and we have seen that different frequency tACS stimulation is able to enhance or decrease some sleep stages. Our initial pilot studies suggest that lucid dreaming can be easily trained using one such stimulation.

We have also been working on making the devices smaller and portable. We are working towards making an ambulatory EEG based PSG device with minimal cables. This work has also helped us making portable/quick headset which can be worn by subject in matter of few minutes.

We have developed real-time wireless limb bands which can act as part of PSG sensors as well as independent device collecting information of the person's movement/sleep over days. These data can be synced to the main PSG system. We are also working on a wireless respiration belt in order to reduce number of cables connected between the subject and the devices.

Our future work which could directly help a normal individual consumer would include—Self-hydrating electrodes headset for longer good quality recording, Portable/Mobile EEG PSG which take less than a minute to wear and can help control IOT devices and other devices. We could control the alarm to ring at the right time like after REM sleep. Control Light intensity based on the sleep stage detection (automated phototherapy).

## ABSTRACT 17

### Event Related Potentials in Sleep

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Sound sleep is very crucial for the normal functioning of a person which includes homeostasis and memory. Quality, quantity and patterns of sleep play an important role in general functioning of human being. There are several ways in which sleep can be studied in the lab setup. But the existing conventional way of sleep evaluation and intervention is not sufficient to completely understand and treat sleep related disorder. In this context event related potentials (ERPs) can be used in dissecting out different components of sleep and evaluate sleep dependent cognitive function.

ERP can be used as a tool to study sleep stabilization in both healthy and patient population. Furthermore, ERPs can also be used to study cognitive performances of patients with sleep disorder. More interestingly, ERPs can be used as intervention during different stages of sleep to improve sleep stability, quality, duration, efficiency and sleep dependent cognitive tasks. One of the important stages of sleep is deep sleep (slow wave sleep) characterized by delta/slow waves, which can be enhanced by stimulation method.

These slow waves or oscillations play very important role in restoration, stabilization of memory and has many physiological and behavioral implications. There are several means to enhance the specific stages of sleep, for example electrical stimulation and pharmacological stimulation. Disadvantage of these modes are practical and technical limitations. Additionally, it's impractical to use electrical stimulation regularly as it needs an assistance of well-trained technician. But the most convenient method is to use acoustic stimulation to enhance slow wave, as it is already well established that auditory tone can influence sleeping brain activity by producing k-complexes. To have a more consistent slow wave enhancement, it is imperative to automatically detect the specific phase of endogenous slow wave in the frontopolar electroencephalographic recordings and deliver the acoustic stimulation, which is called closed loop stimulation. Studies have showed phase-dependent auditory stimulation can increase spindle activity as well as slow oscillation during sleep. There is a dire need to use such phase-locked loop acoustic stimulation protocol to augment slow waves and understand the influence of thus enhanced slow wave sleep in attention, sensory gating and several other higher cognitive abilities using ERPs.

## ABSTRACT 18

### Transcranial Alternating Current Stimulation (tACS) and Sleep: Impact on Sleep Organization

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tACS has kicked open a new door of non invasive electrical stimulation of neuronal assemblies thereby directly entraining the neuronal oscillations. By astute design of intensity, frequency, duration, area of stimulation and phase of stimulation one can modulate brain rhythms. Recent exploratory research has shed light on the impact of various frequencies on the ongoing oscillatory brain rhythms. Application of phosphene threshold tACS stimulations could synchronize or desynchronize neural oscillations. This particular feature makes tACS the perfect tool for intervention studies in disorders like Schizophrenia and Parkinson's disease where an aberrant neural synchrony is a hallmark electrophysiological finding.

Unlike wake state, sleep EEG is a treasure house of peculiar signature patterns, stages, cycles and tightly regulated oscillations. Transient bouts like sleep spindles which are characteristics of stage 2 NREM sleep can be targeted real time and tACS of low frequency electric trains can be triggered which selectively boost these oscillations. Such interventions have showed significant improvement in specific memory task performance, post sleep compared to sham stimulation group. Power spectral analysis reveals the post stimulation changes in the brain rhythms. Spindle-delta dynamics and neuroloop gain are two micro architecture parameters that are modulated by tACS. Low current intensity stimulations in REM stage has been reported to induce lucid dreaming by boosting gamma oscillations. Fronto-temporal bilateral stimulations during REM were more effective in inducing this altered state of consciousness of self aware dream state.

tACS studies in sleeping brain helps us to understand the neural oscillations and their dynamics better. A wealth of information can be gained by analyzing the various frequency stimulations induced changes in sleep organization; both macro and micro sleep architecture.

**ABSTRACT 19****AI Driven Contact-less Pulse Rate, Respiration and Sleep Monitoring**Gaurav Parchani<sup>1</sup><sup>1</sup>Turtle Shell Technologies Pvt. Ltd, tel:9738044710;

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It is estimated that by 2030, over 260 million people will experience sleep related problems. This trend is also true for other lifestyle and physiological disorders. The current healthcare infrastructure will not be able to support such a huge number based on its current growth. There is a need for innovative solutions to identify these disorders in their nascent stage before any serious damage is done. Most of these disorders exhibit abnormal patterns in vitals and sleep even in their nascent stages. Detecting such patterns early on can facilitate suitable actions to prevent them from manifesting into serious illnesses, which in turn reduces costs and burden on the healthcare infrastructure. However, data for such disorders is predominantly available when they have already developed symptoms. Lack of data when the subject is healthy and starts to develop initial signs of a disorder makes it difficult to take prognostic decisions. Dozee is an innovative device that tracks respiration, pulse, movements and sleep without any obstruction or contact with the subject from under the mattress. This enables long term data acquisition in the subject's natural environment without affecting their behavior. Such data will not only help in tracking body vitals, quality of sleep, recovery during sleep but also identifying abnormalities that could be indicative of several disorders.

**ABSTRACT 20****Reentrainment of Circadian Rhythms to Shifted Light-Dark Cycle in Mice**Yujiro Yamanaka<sup>1</sup>, Sato Honma<sup>2</sup>, Ken-ichi Honma<sup>2</sup><sup>1</sup>Graduate School of Education, Hokkaido University, Japan;<sup>2</sup>Research and Education Center for Brain Science, Hokkaido University, Japan, tel:+81 11 706 3496;

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Circadian pacemaker in mammals is located in the suprachiasmatic nucleus (SCN) and entrains to an environmental light–dark (LD) cycle. The SCN pacemaker regulates circadian rhythms in peripheral organs and behavior. After abrupt shifts of LD cycle such as jet travel, circadian rhythms reentrain to the shifted LD cycle with transients of several days. Previous studies using nocturnal rodents demonstrate that circadian rhythms in the SCN reentrains to new LD cycles more rapidly than those of peripheral clocks and behavior.

We examined whether or not timed physical exercise could accelerate the reentrainment of circadian rhythms in mice after 8 h shift of LD cycle. We were able to demonstrate that timed exposure to novel environment (new cage) with a running-wheel dramatically accelerates the reentrainment of circadian rhythm in behavior and some peripheral tissues such as lung and skeletal muscle but not in liver. In addition, the acceleration is dependent on the timing of exposure. To explore possible factors of acceleration, we examined the effect of various non-photoc time cues on the phase-shifts of circadian behavior rhythm in response to an 8 h advanced LD cycle in mice. In this symposium, we'd like to discuss the underlying mechanism of non-photoc acceleration of re-entrainment of circadian behavior rhythm to shifted LD cycle.

**ABSTRACT 21****Sleep–Wake Rhythms in Health and Bipolar Disorders**Sato Honma<sup>1</sup>; Yujiro Yamanaka<sup>2</sup>; Ken-ichi Honma<sup>1</sup>*Guest Professor, Research and Education Center for Brain Science, Hokkaido University, Sapporo, Japan, tel:+81-11-706-4778;**Mail: sathonma@med.hokudai.ac.jp; <sup>2</sup>Hokkaido University Graduate School of Education, Sapporo, Japan*

Under the prolonged temporal isolation, sleep–wake rhythms of human subjects sometimes dissociate from circadian rhythms in melatonin and rectal temperature, and free-run with different periods. The phenomenon is called internal desynchronization which evidentially supports that the oscillator mechanisms underlie the two rhythms are different. The hypothalamic suprachiasmatic nucleus is regarded as the oscillator regulating rhythms in melatonin and rectal temperature. But the neural mechanism(s) directly regulating sleep–wake rhythms still remains to be identified.

In bipolar disorders (BD), sleep–wake rhythms are unstable both in depressive and manic states. Besides, BD patients exhibit a marked circadian change in their moods. We examined the possibility that the instability of sleep–wake rhythms is due to impairment of coupling between the two oscillators. We recorded behavior rhythms of BD patients continuously more than a year using an Actiwatch. Saliva melatonin profiles were also examined. A majority of BD patients examined showed a sign of relative coordination in their behavior rhythms. Chi-square periodogram analysis often revealed multiple circadian periodicities. Saliva melatonin level in day-time was high in these patients. These results suggest an internal desynchronization of sleep–wake and melatonin rhythms. Re-synchronization of the two rhythms would stabilize the sleep–wake rhythms of BD patients.

**ABSTRACT 22****Sleep in the Old**Anita Jagota<sup>1</sup><sup>1</sup>Neurobiology and Molecular Chronobiology Laboratory,*Department of Animal Biology, School of Life Sciences, University of Hyderabad, Hyderabad, 500 046, India, Mail:ajsl@uohyd.ernet.in; Mail:anitajagota01@gmail.com*

Aging is biological, social and environmental phenomenon characterized by progressive decline in all physiological functions. Age depends upon genes, social and environmental influences, and lifestyle. This often leads to depression and reduced socialization resulting in sleep disorders and early aging. The individuals' circadian clocks might have an unusually long cycle, and/or might not be sensitive enough to time cues. Altered or disrupted sensitivity to zeitgebers is probably the most common cause of circadian rhythm disorder with aging.

The suprachiasmatic nucleus (SCN) in hypothalamus contains a light entrained circadian clock, the master pacemaker that orchestrates mammalian physiology and behaviour through regulation of peripheral oscillators. It consists of core gene machinery with positive and negative feedback loops that regulate melatonin synthesis in pineal. The circadian melatonin signal functions as hands of the clock to inform all cells in the organism about the passage of time.

The age-related neurodegenerative sleep disorders in the elderly have increased dramatically parallel to increase in longevity limiting quality of life. Aging is associated with changes in several basic

parameters of circadian timing system (CTS) in mammals leading to circadian dysfunction. The suprachiasmatic nucleus (SCN) in hypothalamus contains a light-entrained circadian clock. It is involved in regulation of neuronal, endocrine and behavioral rhythms through the expression of various clock genes. It regulates the rhythmic production and release of serotonin derivative, melatonin (messenger of darkness) from pineal gland via multisynaptic efferent pathways. This involves close interaction of core circadian machinery with a network of interconnected transcriptional and translational feedback loops.

To understand the age induced stoichiometric alterations in interactomes of daily chronomics in neurodegenerative changes in the functional integrity of CTS, daily rhythms in various parameters in SCN at variable time points [Zeitgeber time (ZT)—0, 6, 12 and 18] in three age groups [3 (adult), 12 and 24 months] of male Wistar rats maintained in light–dark conditions (LD 12:12). We report here, the age-induced change in interactions between various 5-HT metabolism components by middle age (12 m) changing further by 24 m. The m-RNA expression for clock genes such as *bmal1*, *per1*, *per2*, *cry1*, and *cry2* was rhythmic in SCN of adult rats. However in 12 and 24 m, the phases of expression of these genes were significantly altered with abolition of daily rhythms of *rCry1*, *rCry2* and *rBmal1* in 24 m. Differential alterations with aging in the levels and chronomics of 2-D protein profiles and locomotor rhythms were observed. As melatonin, a multitasking molecule, an endogenous synchronizer of rhythm, an antioxidant and an antiaging drug, declines with aging, the effects of melatonin administration on age induced desynchronization in these parameters were studied. This work may prove useful towards targeting novel treatments for circadian dysfunction, good health and longevity.

## ABSTRACT 23

### Restless Legs Syndrome Associated with Disorders of Peripheral Nervous System: Pathophysiological Importance and Differentiation

Dr. Paresh Zanzmera<sup>1</sup>

<sup>1</sup>Associate Professor of Neurology, GMC, Surat

Restless legs syndrome (RLS) is a sensorimotor disorder characterized by discomfort of, and urge to move, the legs (primarily during rest or inactivity), partially or totally relieved by movement, with presence or worsening in the evening, either as primary, often hereditary disorder, or secondary to other diseases or conditions. RLS is generally considered to be a central nervous system (CNS)-related disorder although no specific lesion has been found to be associated with the syndrome. Its prevalence in the general population may range between 5 and 15%. Secondary RLS is known to be associated with polyneuropathy, as described in several reports, although this is still controversial and it has been substantially denied by some studies. However, the occurrence of RLS in association with peripheral neuropathy may be more frequent than usually thought, it is suggested that as many as 45% of patients with RLS might have subclinical sensory neuropathies.

The occurrence of RLS depends upon the type of polyneuropathy. In particular, it has been shown that RLS occurs mainly in association with small fiber sensory neuropathy. Definite types of peripheral neuropathy, such as cryoglobulinaemic neuropathy, CMT2, diabetic neuropathy, and amyloid neuropathy, are especially prone to develop RLS, often as an early manifestation. The co-existence of subclinical or clinical polyneuropathy and RLS has been well documented with objective evidences, including nerve conduction study, quantitative thermal sensory testing, skin sympathetic response (SSR) and skin biopsy.

There seems existence of a peripheral pathway in RLS pathogenesis, a disease classically thought to result from a central dopaminergic and iron deficiency. It has been proposed that spinal RLS generators are activated not only by impaired descending dopaminergic pathways in primary RLS, but also by peripherally disrupted sensory modulation. It seems that RLS might be caused by dopaminergic dysfunction with loss of supraspinal inhibition and enhanced excitability of propriospinal mechanisms, possibly including generators involved in locomotor patterns. Spinal structures involved in RLS, besides being released by dopaminergic dysfunction, might be activated by abnormal sensory nerve inputs associated with peripheral nerve damage in particular, changes in small fibres may trigger mechanisms of rewiring in the dorsal horn, as experimentally demonstrated after small fibre injury. RLS symptoms seem to depend on abnormal spinal sensorimotor integration at the spinal cord level and abnormal central somatosensory processing.

With enough evidence for coexistence of RLS and polyneuropathy and since both manifests as uncomfortable sensations of tingling, numbness, burning, and pain in lower limbs, which would interfere with sleep, certain points would differentiate between the two: worsening of the pain with inactivity or rest, evening worsening of pain, urge to move the limbs, transient improvement of pain with activity or movement, periodic limb movements at night, disturbed night sleep, excessive daytime sleepiness, positive family history and good response to dopaminergic drugs would favor RLS, while symptoms predominantly in sole and feet, existence of ulcer, infection or deformities, abnormal neurological examination and abnormal nerve conduction study favors diagnosis of polyneuropathy.

RLS associated with peripheral neuropathy may require a different therapeutic approach, using neuropathic pain medications such as gabapentin, trazodone, and amitriptyline which are anecdotally effective, rather than dopaminergic therapy.

## ABSTRACT 24

### Yoga Nidra as a Therapeutic Model for Chronic Insomnia

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**Introduction:** CBTI is considered beneficial, though, various complementary and alternative medicine have been tried for insomnia. Yoga nidra is an ancient technique by which sages used to sleep. Yoga nidra has been used as a therapeutic option with no documented side effects. There was a felt need to assess yoga nidra as a therapeutic option and develop a model for its use in chronic insomnia patients.

**Materials and methods:** The principal author visited Bihar school of Yoga, Munger, India and attended sessions of yoga nidra. Permission to use yoga nidra for chronic insomnia patients was taken. She had discussions with the teachers and doctor in the school. She also did sessions herself under supervision while into help planning for the patients subsequently. Planning of the session was done keeping these discussions in mind. Yoga nidra intervention was done using pre-recorded audio CD on yoga nidra© from the school which are available on sale. Planning of the model included assessment of participants for readiness and voluntary participation and conducting supervised sessions. Outcome measures were sleep diary, Pittsburgh sleep quality index, insomnia severity index, depression anxiety stress scales and pre sleep arousal scale. Baseline polysomnography (PSG) was done for all patients. Repeat PSG was done in patients who consented for it.

**Results:** 10 patients in the age group of  $38.5 \pm 2.5$  years (Mean  $\pm$  SD) completed the intervention. After yoga nidra intervention, we found significant improvement in total sleep time ( $p = 0.003$ ), sleep onset latency ( $p = 0.002$ ), WASO ( $p = 0.003$ ), sleep quality ( $p = 0.004$ ), insomnia severity ( $p < 0.0005$ ), and pre sleep arousal scale ( $p < 0.0005$ ) after yoga nidra. There was a significant increase in N3 sleep on PSG.

**Conclusions:** Yoga nidra can be used as an important adjunct in management of chronic insomnia patients.

**Acknowledgements:** The authors acknowledge the support of Bihar School of Yoga Munger, Bihar, India and sleep technicians in the sleep lab in completing this study.

## ABSTRACT 25

### Meditation, Consciousness, and Sleep Quality

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Consciousness may be defined as awareness subjectivity, sentience, wakefulness, and the state of awareness of an external object and awareness of something within oneself. It may also be expressed as any such thing making ability to experience or to feel with executive control system of mind causing optimum control over mind–body communication system. The state of consciousness is being evaluated in terms of level of arousal and responsiveness, alertness and comparison, meaningful communication, and response to a stimulus. In physiological view consciousness is taken as a unitary concept which is being understood by a kind of intuition by majority of people, while few believe it is beyond simple intuition. Consciousness can be altered by changes in the structure or chemistry of brain. Hence, it may be inferred that consciousness is a physical function, just like other behaviour. We can speculate about the origin of this self-awareness to go simultaneously. Under the ambit of split brain concept the parts of brain involved with perception are also associated with the part dealing with behaviour and all jointly responsible for the state of consciousness. Researchers have demonstrated a close affinity in between level of consciousness and quality and quantity of sleep and its modulation by meditation. Meditation is a practice which is reported to modulate the brain functions and associated with an enhanced alpha and theta activity.

Alpha burst in the Electroencephalogram recordings may be the manifestation of deep relaxation, which may inhibit the Autonomic Nervous System stimuli based sleep disturbances. Enhanced Rapid Eye Movement (REM) duration following meditation may further be taken as the changes in other variable such as sleep efficiency, Stage 1, Stage 2 and sleep spindle average as these are the indicators of deep sleep states. It was reported earlier that deep sleep states were restored completely after practice of meditation and REM duration has also been increased in those subject. The result of our study indicated that the total amount of REM sleep which is important in processing various cognitive functions, may be taken as indicator of enhanced consciousness level. Relaxation power in theta-alpha during state Stage 3, Stage 4 and delta wave sleep in long term practitioners of Meditation was reported. The practice of Meditation produces good quality of sleep and brings in higher level of relaxation which is evident from greater alpha omission. It may be inferred that improved sleep structure may be the result of reduced cortical activity which is well established fact stated about different type of meditation, thereby altering level of consciousness. The pathway of mechanism involved in the interrelationship of sleep, consciousness and meditation will be discussed.

## ABSTRACT 26

### Yoga Nidra: an Opportunity for Collaboration to Extend the Science of Sleep States

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The conscious entry into deep, non-REM sleep practiced by yogis under the title *yoga-nidrā* provides an opportunity for a fruitful collaboration that utilizes the sensitive subjective awareness of yogis to focus and fine-tune the increasingly powerful observational technologies at work in investigative neuroscience. This collaboration would best be conducted with a combination of qualitative and quantitative methodologies and can utilize the descriptions of states of consciousness in traditional textual materials to generate measurable hypotheses to be tested. These possibilities are discussed in the context of a review of research literature on *yoga-nidrā* which has so far demonstrated a pronounced lack of clarity and rigor as a result of not using traditional sources to guide either research design or the contemporary practice of *yoga-nidrā*.

## ABSTRACT 27

### Sleep Hygiene in Adulthood after Early Life Stress—an Evidence from Animal Models

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Any insult during stress hyporesponsive period (SHRP) is known to modulate the HPA axis either by inhibiting or reducing its activity beginning a few days after birth and lasting until the pups are weaned from their mother. Previous studies in our laboratory have successfully demonstrated the impact of early maternal separation stress during pre-weaning period on fear learning, memory and emotional reactivity. We also have observed the gender-specific effect of MS on the anxiety-like behavior. Even though researches in the past indicated that stress during early life play an important role in shaping the behavior of an individual, the underlying neural mechanisms involved in these behavioral changes are not well understood. In the present lecture, we show in rats that how hippocampus, prefrontal cortex and amygdala gets connected during the rapid eye movement sleep after retrieval of differential fear conditioning.

Results showed fear conditioning has increased freezing specific conditioned stimuli and less fear to nonspecific stimuli during retrieval session which was associated with increased REM sleep. The study further showed strong correlation between fear memory and network activity in the amygdala-hippocampal-prefrontal cortical circuit during REM sleep providing strong evidence for the memory consolidation takes place during REM sleep. Enhanced REM sleep was associated with increased theta power in Lateral Amygdala (LA) and reduced theta power in CA1 hippocampus. But, increased theta power observed in LA during the first 2 h of sleep was reduced gradually during the later stage of the sleep. In the case of CA1 hippocampus, reduction in theta power was consistent throughout the recording session during REM sleep. This indicates that there is a gradual reduction in fear conditioning-induced theta modulation in amygdala over the period of sleep. The time scale of this gradual change in LA theta power may vary for the reasons of memory consolidation process.

On the other hand, MS rats spent more time in REM stage and total sleep period. MS rats showed fear generalization with increased fear memory retention. Increased theta oscillations in the hippocampus, amygdala and cortical circuits were observed during REM sleep.

These findings suggest that stress during SHRP has sensitized the hippocampus-amygdala-cortical loops which could be due to increased release of corticosterone that generally occurs during REM sleep. Thus, the study indicates that helplessness, anxiety and sleep changes in human patients in adulthood could be correlated to the adverse experience during childhood.

## ABSTRACT 29

### Neural Correlates of Arousal and Sleep Homeostasis

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The two opposing behavioral states, ‘arousal’ and ‘sleepiness’, are regulated by the subcortical forebrain region, the basal forebrain (BF). Initially recognized as the ventral arm of the ascending reticular arousal system, the BF is strategically located to modulate cortical activity. Emergence of optogenetics, chemogenetic and selective lesioning of neuronal subtypes have expanded the information on neuronal circuitries for arousal many of which either project directly to cortex or relay through basal forebrain. An important outcome of these studies is that the widely-popularized notion of cholinergic and monoaminergic role in promoting wakefulness is challenged by the new evidence supporting the importance of GABAergic and glutamatergic neurons in promoting wakefulness.

While the importance of BF in arousal remains unchanged, much attention has shifted to the complex mix of GABAergic and glutamatergic neurons that coexist with cholinergic neurons in BF. All three neurotransmitter systems have been implicated in cortical arousal. However, the cholinergic neurons also gained prominence for their role in sleep homeostasis. The localized increase in extracellular adenosine in BF and its dependence on the presence of cholinergic neurons, sets the stage for homeostatic sleep response. The speaker will review the arousal neuronal circuitry, with specific focus on the interactive role of GABA, glutamate, and acetylcholine in the regulation of wakefulness and sleep homeostasis.

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## ABSTRACT 31

### Mental Health Disorders and Sleep: Promising Results and Caveats

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Mental health disorders and sleep are known to have a complex bidirectional relationship. Abnormalities of sleep present as symptoms of psychiatric disorders; and treatment of the sleep problem may help alleviate symptoms of the psychiatric condition. On the other hand, patients with primary sleep disorders may be vulnerable to develop various psychiatric disorders. Impairment of sleep involving some or all of the sleep stages have been reported in various psychiatric conditions such as major depression, schizophrenia, dementia, bipolar disorder, generalized anxiety disorder, post-traumatic stress disorder, substance dependence, childhood psychiatric disorders such as attention-deficit hyperactivity disorder etc.

There are preliminary evidences for disorders of sleep playing a causal role in the genesis of various psychiatric disorders or their

specific symptomatology. A substantial body of research has investigated the patterns of sleep abnormalities in various psychiatric disorders using advanced methods of analyses of the whole-night polysomnogram. Such studies have generated various hypotheses regarding the basic pathophysiological abnormalities underlying these disorders based on the various sleep-cycle abnormalities noted. However, definitive conclusions regarding the utility of these findings as biomarkers of the disorders are still elusive. Nevertheless, macro- and micro-architectural study of sleep provides an important window of opportunity towards improving our understanding regarding the basic pathophysiological abnormalities underlying various psychiatric disorders and their management.

## ABSTRACT 32

### CPAP non Compliance and Surgical Failures in the Treatment of Obstructive Sleep Apnea

Dr. V K Vijayan<sup>1</sup>

<sup>1</sup>Former Director, Vallabhbhai Patel Chest Institute, University of Delhi

Continuous positive airway pressure (CPAP) is the primary treatment of Obstructive Sleep Apnea (OSA). CPAP therapy has been reported to reverse sleep apnea and to have favourable effects on the sleep physiology resulting in reduction in daytime sleepiness and automobile accidents, and in decreasing the blood pressure and other cardiovascular events. It has been suggested that CPAP use is required at least 4 h per night to have beneficial effects. However, it has been observed that 29–83% of patients are nonadherent to CPAP therapy. There are many predictors of CPAP use and an important predictor of CPAP use is interface/masks used for CPAP therapy. Mask/interface related problems include leaky mask, bad mask fit, dry or stuffy nose after wearing a mask and very dry mouth. Annoying noise made by the machine is a problem especially with spouses. Important side effects from CPAP usage are nasal congestion, sneezing, nosebleeds, sinusitis, and a runny nose, stomach discomfort and bloating, suffocation or claustrophobia, facial skin rashes, abrasions, sores, and pinkeye, tinnitus and bronchitis and respiratory infections. Increased nasal resistance has been reported to influence the acceptance of CPAP and adherence. It is important to explain the benefits of CPAP therapy and address the interface related problems to enhance adherence. Patients with claustrophobia tend to be less adherent to CPAP therapy. Initial perception of CPAP as a desirable and effective treatment of OSA can be an important factor in acceptance of CPAP by the patient. Interventions to improve adherence include humidification of the airway, machine design including cost especially in developing countries and behavioural interventions. Studies have reported a correlation between patient adherence and treatment outcomes. Newer CPAP machines can track adherence, hours of use, mask leak, and residual apnea–hypopnea index (AHI). CPAP tracking systems may be useful to track CPAP adherence

Several surgical procedures have been undertaken to enlarge the diameter of the upper airway and have been advocated as important tools in the treatment of OSA. Surgical procedures include nasal surgery to reduce resistance, tonsillectomy, radiofrequency ablation of the tongue base or palate, surgical advancement of the mandible, or more extensive surgeries to change the structure and dimensions of the upper airway. Mandibular advancement therapy has been found to reduce OSA severity and symptoms in symptomatic patients with severe OSA. However, surgical treatment is invasive and the efficacy of the procedure cannot be predicted with preoperative screening.

In certain situations, OSA may be worsened after surgery and the surgical procedure cannot be reversed once found to be not effective.

Persistent side-effects have been reported to occur after uvulopalatopharyngoplasty and uvulopalatoplasty in about half the patients; and difficulty in swallowing, globus sensation and voice changes were especially common side effects. Several types of oral appliances that advance the mandible are available for the treatment of OSA. Many patients prefer mandibular advancement splints (MAS) due to ease of use and being less invasive than both CPAP and surgery. Long-term compliance with MAS has been reported to be high ranging from 50 to 100%. However, approximately 40% of patients using MAS have clinically elevated AHIs. The safety and feasibility of using an embedded microsensor thermometer in patients with OSA to measure the compliance of oral appliance was confirmed in a prospective clinical trial. Though MAS is a well-tolerated procedure, adverse effects of MAS include tooth and jaw pain, dry mouth, and hyper-salivation. Long-term use can also cause subtle dental and facial structural changes which may worsen progressively over time with long-term use.

## ABSTRACT 33

### Tongue-Tie a Frequent Phenotype for Pediatric Sleep Apnea

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Tongue tie and; Lip tie Support Group. Consultant, Apollo Hospital Chennai

Normally at birth, the tongue is placed high in the palate, and its continuous activity related to sucking, swallowing, breath and masticating induces stimulation of the intermaxillary synchondrosis. This is active until 13–15 years of age, leading to normal oro-facial growth. Normal nasal breathing is associated with this tongue position.

A short lingual frenulum has been associated with the sucking and swallowing difficulty early in life, leading to clipping of the frenulum in the newborn. In older children speech difficulties have been related to an untreated short frenulum, it was also shown to lead to mouth breathing with modification of the position of the tongue and secondary orthodontic imparts resulting in an anterior and posterior crossbite, a disproportionate growth of the mandible and an abnormal growth of the maxilla. All these anatomical changes impart the size of the upper airway and increase the risk of its collapse during sleep. This presentation is an overview to show a series of cases where lingual frenotomy is performed using lasers, thereby improving the breastfeeding, which is shown to be the preventive effect on obstructive sleep apnea in children and adults.

## ABSTRACT 34

### Infant Sleep and Sensory Processing Difficulties: Occupational Therapy Aspect

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Sleep is central to our health. For children the quality, regularity and depth of their sleep influence all aspects of their functioning. Sleep

awakenings in infants and toddlers foreshadow sleep and self-regulation difficulties through maturity.

Sensory Integration refers to individual's ability to organize, integrate and process sensory information received from inside the body and from external environment to proceed purposeful and goal directed response. Infant with sensory challenges lack adequate rest, Potential reason includes difficulty in lowering the arousal level of their central nervous system to achieve calm state necessary to fall asleep. Sensory under responsive/sensory defensive infant's often manifest poor oromotor skill-sucking. Sucking plays major role in Self-regulation. Increased sleep disruption associate with increased sensitivity because children with poor sensory pattern have a low neurological threshold and use a passive self-regulation strategy. Infants/toddlers who demonstrate increased sensitivity require a longer time to settle to sleep. Early intervention by OCCUPATIONAL THERAPY using the sensory integration approach facilitates sleep and helps children to achieve self-regulation which is essential for their developmental milestones.

The overview of the presentation is that the Sensory Processing Pattern has a major impact in infants' Sleep and Self-regulation.

## ABSTRACT 35

### Association of Leptin Receptor Gene Polymorphism with Obstructive Sleep Apnea Syndrome in Obese Subjects

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Obesity is the main risk factor for occurrence of Obstructive Sleep Apnea Syndrome (OSAS). Obese individuals have nearly four times higher risk of having OSAS as compared to non-obese individual independent of age and gender. Leptin plays a critical role in the regulation of body weight by inhibiting food intake and stimulating energy expenditure. Leptin level is increased in OSAS subjects and positively correlate with the severity of OSAS. Several studies have been reported showing importance of LEPR gene polymorphisms as risk factors of obesity and hyper leptinemia. Consequently, these gene polymorphisms may predispose an individual for risk of occurrence and increase in severity of OSAS. Aim of the present study was to evaluate the significance of LEPR K109R, Q223R, and K656 N gene polymorphisms on severity of OSAS which is measured by Apnea-Hypopnea Index (AHI).

A cross-sectional study was done in 190 subjects aged 18–65 years, after taking informed consent. Genotyping and estimation of serum Leptin levels were done in all subjects. Polysomnography (PSG), anthropometrical measures and biochemical investigations were also done. Apnea-Hypopnea Index (AHI) was calculated with the help of Somnologica Studio software. Four groups (AHI <5, 5–15, 15.1–30 and >30) were compared. Significant difference was observed in distribution (%) of degree of severity of disease ( $p = 0.04$ ) in different BMI group. In this study, obesity variables- body mass index (BMI), neck circumference (NC), waist circumference (WC), hip circumference (HC) and waist to hip ratio (WHR) were not found to be associated with LEPR gene polymorphisms studied in the present work. We observed significant association of Q223R gene polymorphism with blood pressure (BP) ( $P < 0.05$ ) and nocturnal max pulse rate ( $P < 0.05$ ). K656N gene polymorphism was associated with AHI ( $P < 0.05$ ), average desaturation levels ( $P < 0.05$ ) and HDL-C ( $P < 0.05$ ). Fasting plasma glucose levels and serum fasting leptin levels were not found to be associated with any of three LEPR gene polymorphism.

These findings suggest that LEPR Q223R and K656 N gene polymorphism may influence BP, max pulse rate, AHI, average desaturation levels and HDL levels in these Subjects. These results represent effect and association of LEPR gene polymorphism at position K109R, Q223R and K656N on obesity, disease phenotype, leptin levels, and may be applied for assessment of high risk population for OSAS and associated clinical conditions in obese population. Understanding of such genetic risk factors is crucial in drawing predictive models that integrate both genetic and phenotypic markers, thereby enabling early diagnosis and treatment.

**Keywords:** Obesity, Leptin, Gene Polymorphism, Obstructive sleep apnea syndrome

### ABSTRACT 36

#### Prevalence of Type of Childhood Parasomnias Among Children Attending a Tertiary Care Hospital in North India, a Cross Sectional Study

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**Background:** Childhood parasomnias are increasing in prevalence and reported to have plethora of adverse impact on child's physical and psychological well being. These are one of the most underdiagnosed and undertreated health condition in India due to poor awareness among both parents and health care practitioners.

**Objectives:** To estimate the age and gender wise prevalence of parasomnias, among 4–10 years' children attending a tertiary care teaching hospital.

**Materials and methods:** The current study was a cross sectional study of 4 to 10-year-old children attending paediatric department of a tertiary care teaching hospital situated in North India. Children with nocturnal and frontal lobe epilepsy insomnia or dysomnia were excluded from the study. The parents of the children were interviewed by self-administered Children's Sleep Habits Questionnaire.

**Observations and results:** A total of 500 children were included in the final analysis. The overall prevalence of parasomnias was 328 (65.6%, 95% CI, 61.3–69.6%), which was slightly higher in females 335 (67%) than males 323 (64.7%). Among both genders, the prevalence was highest among children <5 years. Bruxism was the most common parasomnia reported in 289 (57.8%) children. This was followed by Sleep terrors 263 (52.6%), somniloquy 262 (52.4%), enuresis 250 (50%) and morning wakening 113 (22.6%). Somnambulism was reported in 73 (14.6%) children. In Onset at age 4 the prevalence is high in Enuresis (30.1%); than Bruxism (27.2%); morning waking (26.5%); somnambulism (24.7%); somniloquy (24.6%); and sleep terrors (23.3%). While in offset, for age 4 the prevalence is high in Bruxism (18.3%) followed by sleep terrors (17.4%); Enuresis (16.8%); somnambulism (16.6%); somniloquy (16.6%) and morning waking (10.9%).

**Conclusions:** The prevalence of childhood parasomnias is very high in Indian children, with highest prevalence among girls less than 5 years.

### ABSTRACT 37

#### Physiotherapy Interventions in Improving Sleep Quality

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Sleep quality is a very important construct in sleep because of two most important reasons. Firstly, the complaint of poor sleep quality is fairly common; study conducted in India indicates that 13.6–15.34% of patients reporting to AIIMS sleep clinic reported difficulty in falling asleep as their chief complaint whereas 22.73–31.4% complained of frequent awakenings which can be considered as indicators of sleep quality disturbances. Secondly poor sleep quality can be an indicator or clinical symptom in a number of clinical disorders including sleep apnea, insomnia etc. and it can be associated with bad health, high healthcare costs, absence from work and increased risk of psychiatric disorders. Thus making it a very important construct to study.

Physiotherapy has four pillars i.e. Electrotherapy, Exercise therapy, mechanical therapy, and manual therapy which are used in various permutations and combinations to give the final effective result. Physical agents are a term used for the agents which use physical properties and includes modalities from electro and exercise therapy. Physical agents are various forms of energy and materials applied to patients and their means of application. It includes heat, cold, pressure, electrical currents etc. This presentation will be giving a brief introduction to the effect of these agents on sleep quality thus opening a path for their use as a part of a pharmacological intervention of sleep problems which have gained immense popularity in recent times.

**Keywords:** sleep quality, physical agents, interferential therapy, exercise

### ABSTRACT 38

#### Food Allergy Insomnia

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As defined by the International Classification of Sleep Disorders, this is a disorder of initiating and maintaining sleep due to an allergic response to food allergens. The history dates back to initial published reports since 2012 that were mainly based on hypothetical observations by previous researchers. Most crucial to the pathophysiologic mechanisms leading to wakefulness is the enhanced activity of histamine. Being a mediator of wakefulness, its activity gets enhanced in atopic individuals secondary to allergic response to foods. The tuberomammillary nucleus in posterior hypothalamus is the source of histamine in brain, that sends projections to the entire central nervous system. The American Academy of Sleep Medicine has defined

diagnostic criteria for diagnosis of the disorder and the entity is briefly described in the recent text books of sleep medicine based on previously published reports.

Although previously published cases belonged to pediatric population, we are now observing insomnia secondary to food allergies in adults with scientific base where other causes of insomnia are excluded (yet unpublished data). Wonderful observations and encouraging treatment outcomes prompted us to compile a book chapter published this year. To conclude, food allergy insomnia is a clinically important entity from public health point of view demanding further research.

## ABSTRACT 39

### Herbal Remedies as Safe Natural Sleep Aid

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Sustained stress in the modern societal set up often disrupts the normal sleep duration and cycle which is known to lead to cognitive impairments and disruption of neuro-immune-endocrine interactions. Sleep deprivation (SD) causes a spectrum of mood disorders like anxiety, cognitive dysfunctions and motor coordination impairment in humans and no therapeutic remedy is currently available for the amelioration of detrimental effects caused by SD. Our lab studies are aimed to scientifically validate the traditional use of herbal medicines and the research work is mainly focused on two plants, *Withania somnifera*, commonly known as Ashwagandha and *Tinospora cordifolia* (Giloy or Guduchi).

The study is aimed to elucidate the effects of water extract from leaves of *Withania somnifera* (ASH-WEX) and 50% ethanolic extract from *Tinospora cordifolia* in amelioration of immune function impairment caused by SD. Three groups of animals, i.e. Vehicle-Undisturbed sleep (VUD), Vehicle-Sleep deprived (VSD) and extract fed sleep deprived (ESD) rats were tested for their anxiety-like behavior as well as learning and memory and further used for the study of inflammatory, neuronal plasticity and apoptotic markers expression in piriform cortex and hippocampus regions of the brain. At the molecular level, VSD rats showed acute change in the expression of proteins involved in synaptic plasticity, cell survival, and apoptosis in the hippocampus region of brain, which was suppressed by extracts treatment thus indicating decreased cellular stress and apoptosis in ESD group.

The data suggests that extracts from these plants may be potential agents to suppress the acute effects of sleep loss on anxiety as well as on learning and memory impairments and may emerge as a novel supplement to control SD-induced cognitive impairments. Keeping in view the detrimental health effects of sleep loss due to prolonged wakefulness, Ayurvedic medicines may offer safer and cost effective means for amelioration of brain function impairments compared to the conventional medicines which are generally coupled with adverse side effects.

## ABSTRACT 40

### Sleep Disorders—a Molecular Perspective

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The International Classification of Sleep third edition (ICSD-3) has grouped sleep disorders into six major categories; Insomnia, Sleep related breathing disorders, central disorders of hypersomnolence, circadian rhythm sleep–wake disorders, parasomnias, sleep related movement disorders. Understanding of the pathophysiology and molecular mechanism of these sleep disorders may provide an insight regarding how and under what conditions the disorder develops. Knowledge of the specific targets and molecular markers in these conditions will help us in early identification, evaluation, prevention and treatment. This session would primarily focus on the current knowledge available from various domains of research in unraveling the molecular mechanisms in these six major categories of sleep disorders.

## ABSTRACT 41

### Oral Appliance Therapy for Obstructive Sleep Apnea

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Dental sleep medicine promotes the research and clinical use of oral appliance therapy and upper airway surgery, for the treatment of sleep-related breathing disorders, such as Obstructive Sleep Apnea, and provides training and resources for dentists and other professionals who work directly with patients.

Dental clinics have an important place in screening of patients with Obstructive Sleep Apnea (OSA). Dentists can easily recognise Large necks, Small or recessed chins, Overbite or Shimbashi <18 mms, Scalloped tongues, Large tongue volume, Pharyngeal constriction, Eroded enamel, Elongated Soft Palate, Elongated/Enlarged Uvula, Enlarged tonsils, Mandibular Tori, Decreased inter-molar distance with vaulted palate etc... Suspected OSA patients are referred to sleep physician for diagnostic sleep study and treatment modalities are decided depending on the severity of OSA and suitability of various treatment options for a particular patient.

Dentists play an important role in the team approach to the treatment of obstructive sleep apnea. According to American Academy of Sleep Medicine (AASM), “Oral appliances are indicated for use in patients with mild to moderate OSA who prefer OAs to CPAP, or who do not respond to CPAP, are not appropriate candidates for CPAP, or who fail treatment attempts with CPAP or treatment with behavioural measures such as weight loss or sleep-position change.”

AASM further adds, “Oral appliances should be fitted by qualified dental personnel, who are trained and experienced in the overall care of oral health, the temporomandibular joint, dental occlusion and

associated oral structures. Dental management of patients with OAs should be overseen by practitioners who have undertaken serious training in sleep medicine and/or sleep related breathing disorders with focused emphasis on proper protocol for diagnosis, treatment, and follow up.” Dentists who are specifically trained in aspects of sleep medicine and have a command of multiple appliance modalities are of great help to physicians in treating patients with sleep disordered breathing problems.

Oral appliances are worn in the mouth to treat snoring and OSA. They maintain an opened, unobstructed airway. There are many different FDA-approved oral appliances available. The device prevents the airway from collapsing by either holding the tongue or supporting the jaw in a forward position. Dentists trained in dental sleep medicine (DSM) are familiar with the various designs of appliances, determine which one best suits your specific needs and work with physician/sleep specialist as part of a medical team.

#### ABSTRACT 42

##### Differentials and Management of Excessive Daytime Sleepiness (EDS)—Psychiatrist’s Perspective

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Wanted or not, ‘sleep problems’ excess or deficient, first tend to find their way into the office of a mental health clinician. In our daily practice, we tend to deal with a lot of patients in whom the diagnosis of EDS is unknowingly missed. It is useful to remember that any daytime sleepiness is not EDS and a definitive diagnosis is required as early as possible to decrease the ensuing disability and dysfunction. As discussed before, the primary syndromes of EDS and psychiatric illnesses are surely good to consider while evaluating a case of EDS; however, sleep related movement disorders, connective tissue disorders, CNS disorders (ex: encephalitis, meningitis, post-trauma) as well as certain medical conditions (ex: congestive cardiac failure, endocrinopathies, etc.) serve as important differentials.

The detailed management of each of the disorders of EDS would be out of the scope of this symposium. However, we shall briefly outline the treatment of the conditions leading to EDS, which were discussed in all the previous sections. Treating the primary condition is probably the mainstay in many cases, however the role of stimulants (like methylphenidate, atomoxetine, etc.), sodium oxybate, selective serotonin reuptake inhibitors (SSRIs) in directly treating the symptom of EDS would be highlighted. Specific role of modalities: ex, positive airway ventilation (CPAP) in sleep apnea and iron supplements in RLS shall be brushed upon. Management of narcolepsy shall receive a special focus.

Also, throughout this section we shall summarize our understanding of this disabling construct of EDS and how its timely treatment can restore an individual’s quality of life and prevent further complications.

#### ABSTRACT 43

##### Regulation of Insulin Metabolism by Intermittent Hypoxia. Molecular Mechanisms

Ning Wang<sup>1,2</sup>, Shakil A. Khan<sup>1,2</sup>, Gregg L. Semenza<sup>1,2</sup>, Nanduri R. Prabhakar<sup>1,2</sup>, Jayasri Nanduri<sup>1,2</sup>

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Obstructive sleep apnea patients, experiencing chronic intermittent hypoxia (CIH) are prone to several co-morbidities including hypertension and type 2 diabetes. However, the effects of CIH on pancreatic beta cell function are not known which is investigated in the present study. C57BL6 mice exposed to 30 days of CIH exhibited elevated levels of fasting plasma insulin, but comparable glucose levels, and higher homeostasis model assessment (HOMA), indicating insulin resistance. More importantly, glucose-stimulated insulin secretion (GSIS) was impaired in CIH exposed mice and in isolated islets. Reactive oxygen species (ROS) levels were elevated in CIH exposed pancreatic islets. Treatment of mice with MnTmPyP, a ROS scavenger during CIH exposure, prevented the augmented insulin secretion and restored HOMA values to control levels. Hypoxia-inducible factor 1 (HIF-1) dependent ROS mediate many of the systemic and cellular responses to CIH. We tested the role of HIF-1 $\alpha$  in IH-induced pancreatic beta cell dysfunction. HIF-1 $\alpha$  was elevated in pancreatic islets from 30 days CIH-exposed WT mice but not in mice with partial deficiency of HIF-1 $\alpha$  (Hif1 $\alpha$ <sup>+/-</sup>). IH augmented basal insulin secretion, impaired GSIS and increased ROS were either absent or attenuated in IH-exposed Hif1 $\alpha$ <sup>+/-</sup> mice. Pharmacological blockade of HIF-1 $\alpha$  accumulation with digoxin showed similar results suggesting that CIH-induced pancreatic beta cell dysfunction is mediated by HIF-1 $\alpha$  dependent ROS. Supported by NIH-HL-090554

#### ABSTRACT 44

##### Dental Sleep Medicine

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The field of dental sleep medicine has witnessed an exponential growth in the last decade. Research into the various aspects of dental sleep medicine are opening new insights and offering evidence based prevention and management strategies to help patients with Sleep Disordered Breathing (SDB). Dental Sleep Medicine is an area of dental practice that focuses on the use of Oral Appliance Therapy (OAT) to treat sleep-disordered breathing, including snoring, obstructive sleep apnea (OSA) and also conditions such as bruxism. Interdisciplinary management has become the current norm for

providing optimal care to patients with SDB. Dental specialists trained in dental sleep medicine may serve as an additional resource for screening, referral to physicians, offering early intervention, preventing chronicity and reducing the socioeconomic and healthcare burden associated with these conditions. Dental sleep specialists work together with sleep physicians to identify the best treatment for each patient.

The etiopathogenesis of SDB is multifactorial. Craniofacial disharmony is one of the important risk factor for OSA. Mandibular retrognathism, long, narrow face, retrusive maxilla, inferiorly placed hyoid bone and increased lower anterior facial heights are certain craniofacial morphologic features associated with an increased risk for OSA. Many of these features can be modified and corrected during the growth phase by utilizing emerging dental treatment options such as rapid maxillary expansion, oral appliances and distraction osteogenesis. Upper airway space may also be increased through different surgical procedures. A recent systematic review and meta-analysis on the different surgical procedures utilized to increase airway space has concluded that Maxillo mandibular advancement surgery may be the most effective among the different surgical procedures.

Oral Appliance therapy is the mainstay of treatment of SDB. OAT is used to treat OSA/snoring and associated symptoms. It is generally advised as a standalone therapy, but can be used in conjunction with other modalities for patients with mild–moderate OSA. It can also be used in severe OSA patients who are unable to use or do not respond to CPAP. OAT has been documented to decrease duration of apneas, hypopneas, RERA's, primary snoring, nocturnal oxygenation, adverse health and social consequences associated with OSA. There are numerous types of oral appliances which may be readily available or can be custom made. A study which compared readymade appliance vs the custom made titratable appliances found that readymade appliances are not effective and there is no evidence to suggest use of readymade appliances to treat OSA.

FDA approved dental appliances can be broadly grouped into Tongue Retaining Devices (TRD), Mandibular Advancement Devices (MAD) and combination appliances which can be used with a CPAP. TRD is used to hold the tongue in an anterior position and is suitable even in edentulous subjects. However it is not very popular and patient compliance is comparatively low. The most popular among OAT are the MAD. These appliances are used to advance the mandible and open the airway space. It is custom made in a dental setting, and may be titratable or non-titratable. Titratable appliances that are currently available can be titrated in increments as minimal as 0.25 mm.

Recent advances in technology have also allowed the dentist to utilize special dental trays during overnight polysomnography to determine the most effective mandibular protrusive position. Side effects of MAD are generally mild and comprise of morning TMJ pain, dental and occlusal changes. The TMJ pain can be reduced by performing certain jaw exercises. A small percentage of patients may also report tongue pain, sore cheeks, excess salivation, dry mouth, material allergy, emotional changes, difficulty swallowing, change in speech, gagging clenching, grinding, appliance breakage, odors, and loosening restorations/crowns. Combination of Oral appliances with CPAP are also available. These appliances often help in improving patient compliance to CPAP and use CPAP at lower pressure settings.

Dental sleep medicine is making rapid strides with increasing awareness coupled with recognition of role of dental sleep specialists in preventive and therapeutic management. Research into the different aspects of dental sleep medicine has been successful in validating and offering new treatment strategies. Dentists may play an important role in the interdisciplinary team through preventive and management strategies of snoring and OSA in children and adults, with an emphasis on oral appliances as a means to treat the adult population. Interdisciplinary collaborative management utilizing dental sleep specialists in a sleep physician centered treatment setting may offer

additional benefits to patients with mild to moderate OSA and in patients who are noncompliant with other treatment strategies.

## ABSTRACT 45

### A Potential Role of P75 Neurotrophin Receptor in Mediating Synaptic Changes in Sleep Deprivation

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One of the major challenges in sleep research is the elucidation of molecular mechanisms and cellular circuits underlying the adverse consequences of sleep loss, particularly in regarding with learning and memory. The p75 neurotrophin receptor regulates cell death and/or survival, axonal growth and synaptic plasticity. Expression of the p75 neurotrophin receptor increases markedly after neural injury and this can contribute to neuronal death, axonal degeneration and dysfunction.

A better spatial memory has been noticed in p75 neurotrophin receptor deficient mouse strains. Thus, targeting p75 neurotrophin receptor can be a novel strategy to counteract the damaging effects of sleep loss on cognitive function. Here, we use genetically modified animal models to elucidate a potential signaling pathway on how brief sleep deprivation can lead to impairment of hippocampal-dependent synaptic plasticity and hence cognitive deficits. Consistent with the previous studies, our data show 4 h of sleep deprivation impairs the maintenance of late long-term potentiation (LTP). Associative memory is also affected in sleep-deprived mice as evidenced by both synaptic-tagging and capture (STC) electrophysiology and inhibitory avoidance behavioral studies. Surprisingly, sleep-deprived mutant mice strain without p75 neurotrophin receptor rescue the late LTP to the level comparable to non sleep-deprived mice. Furthermore, associative memory is unaffected in these mutant mice. The level of hippocampal phosphodiesterase (PDE4A5) was significantly higher in sleep-deprived mice compared to non sleep-deprived mice. There was however, no significant difference in hippocampal PDE4A5 protein between non sleep deprived and sleep deprived from p75 neurotrophin receptor mutant mice. Thus, interfering an interaction between p75 neurotrophin receptor and PDE4A5 may protect cAMP from degradation and hence rescuing the synaptic plasticity and cognitive deficits as a result of sleep loss.

## ABSTRACT 46

### Restless Leg Syndrome and Neurodegenerative Disorders: Recognition and Treatment Challenges

Dr. Geetika Bajpai<sup>1</sup>

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Restless leg syndrome is a highly prevalent disorder known for many centuries but yet has many challenges both in terms of its diagnosis as well as treatment and probably even in its nomenclature.

Restless legs syndrome (RLS) has been mentioned in ancient Greek and Chinese literature but was described as an entity by Sir Thomas Willis, a British anatomist and physician in 1685. He said "...the diseased are no more able to sleep, than if they were in a place of the greatest torture". Karl Ekbom of Sweden first used the term 'restless legs syndrome' in 1945 and did significant pioneering work

in its etiopathogenesis. Hence RLS is also known as Willis–Ekbom disease. Though a study published in 2015 concluded that a greater proportion of newly graduated physicians diagnosed themselves with RLS/WED when presented with the term Restless Legs Syndrome than when presented with the term Willis–Ekbom Disease. The extrapolation of these results to general population would be self-explanatory.

The diagnostic criteria for this nosological entity was first laid down by IRLSSG through interdisciplinary and collaborative efforts in 1995. It has been improvised over the years with accumulating literature to improve the sensitivity and specificity of the criteria; which would finally improve the clinical practice and promote further research. The latest amendment was published in 2012.

Yet single question developed by Ferri et al. i.e. “When you try to relax in the evening or sleep at night, do you ever have unpleasant, restless feelings in your legs that can be relieved by walking or movement?” This validated question has 100% sensitivity and 96.8% specificity for the diagnosis of RLS.

Hence the diagnosis is purely clinical and response based. In absence of absolute diagnostic parameter in blood chemistry, electrophysiology or radiology; it leaves much scope for missed diagnosis or even over diagnosis. But having said that these set diagnostic criteria is result of sharp clinical acumen of observant and diligent clinicians and has paved the way of learning till date.

It has helped us achieve a treatment strategy for the disease. Though failure of first line medications, rescue therapy and its complications, augmentations and poor response to treatment remain as potent treatment challenges in our clinical practice. It is important to identify these challenges and find an answer to them because the biopsychosocial and economic burden of RLS has negative impact on quality of life of the patient leading to decreased productivity, increased absenteeism, unemployment and poor interpersonal relationship.

#### ABSTRACT 47

##### Sleep Abnormalities in Epilepsy

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Since ancient times, researchers and philosophers have recognized that a complex and reciprocal relationship exists between sleep and epilepsy. Some common neuro-physiological mechanisms are thought to link the various states of vigilance to epileptiform activity causing them to interact with each other and hence influence one another.

Patients with epilepsy (PWE) have several disturbances in sleep architecture that occur despite the absence of daytime-seizures and antiepileptic drugs (AEDs), and this is suggestive of *inherent sleep instability in the epileptic brain*. Arousal instability during sleep not only contributes to sleep disorganization but also acts as a potential trigger to activate epileptiform activity. Consequently, the occurrence of epileptiform activity during sleep can further hinder sleep continuity and worsen arousal instability, causing a vicious cycle of poor sleep quality and intractable seizures. Therefore, this study evaluates the macro and microstructural sleep characteristics of PWE, which are reliable biomarkers of sleep quality and arousal fluctuations in sleep, respectively and this can in turn improve the understanding of the sleep and epilepsy interrelationship.

Many cellular level studies using brain slices and cultures reveal that a large network of connectivity ensures emergence of neuronal synchronization. The changes in the strength of cortical synchronization (derived from EEG phase synchronization analysis) gives us an overview regarding the nature of coupling in the brain during sleep and wake periods alongside

the occurrence of inter-ictal epileptiform discharges (IEDs). The rise in cortical synchronization during seizure activity demonstrates an increased neuronal coupling in epileptic foci and is thought to be a manifestation of the perpetual synaptic remodeling occurring within these brain networks. In the current study, we use background electroencephalography (EEG) epochs as well as IEDs during wake and different stages of sleep taken from PWE and healthy controls as a paradigm to understand neo-cortical dynamics involved in synchronization during the various states of vigilance in neuronal ensembles.

This review aims to critically analyse the published literature focusing on the reciprocal interrelationship between sleep and epilepsy and return bring out some important considerations one needs to keep in mind when dealing with patients where these two conditions are interacting.

#### ABSTRACT 48

##### Regulation of Insulin Metabolism by Intermittent Hypoxia - Molecular Mechanisms

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Obstructive sleep apnea patients, experiencing chronic intermittent hypoxia (CIH) are prone to several co-morbidities including hypertension and type 2 diabetes. However, the effects of CIH on pancreatic beta cell function are not known which is investigated in the present study. C57BL6 mice exposed to 30 days of CIH exhibited elevated levels of fasting plasma insulin, but comparable glucose levels, and higher homeostasis model assessment (HOMA), indicating insulin resistance. More importantly, glucose-stimulated insulin secretion (GSIS) was impaired in CIH exposed mice and in isolated islets. Reactive oxygen species (ROS) levels were elevated in CIH exposed pancreatic islets. Treatment of mice with MnTmPyP, a ROS scavenger during CIH exposure, prevented the augmented insulin secretion and restored HOMA values to control levels. Hypoxia-inducible factor 1 (HIF-1) dependent ROS mediate many of the systemic and cellular responses to CIH. We tested the role of HIF-1 $\alpha$  in IH-induced pancreatic beta cell dysfunction. HIF-1 $\alpha$  was elevated in pancreatic islets from 30d CIH-exposed WT mice but not in mice with partial deficiency of HIF-1 $\alpha$  (Hif1 $\alpha$ +/-). IH augmented basal insulin secretion, impaired GSIS and increased ROS were either absent or attenuated in IH-exposed Hif1 $\alpha$ +/- mice. Pharmacological blockade of HIF-1 $\alpha$  accumulation with digoxin showed similar results suggesting that CIH-induced pancreatic beta cell dysfunction is mediated by HIF-1 $\alpha$  dependent ROS. Supported by NIH-HL-090554

#### ABSTRACT 49

##### Paediatric restless legs syndrome:

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Recent classification of sleep disorders (ICSD-3) has proposed that the criteria for the paediatric RLS should be similar to that of adult criteria. However, children have often difficulty in verbalising the complaints and it is often missed. This problem is compounded by the fact that even among Indian adults, presentation of RLS is different from that of western counterparts. Issues related to diagnosis of

paediatric RLS will be discussed in Indian context. Our data shows that RLS complaints have been reported by around 3–5% children in India report RLS. Demographic data suggests that gender difference does not exist during younger age group. These children have poorer sleep and higher prevalence of ADHD.

## ABSTRACT 50

### Exercise mediated management of Sleep quality

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Sleep has been rightly considered as the third pillar of health alongside nutrition and exercise by researchers. It has become an important aspect of quality of life which has also led to a deeper understanding of the ill effects of lack of sleep. Sleep is one of the factors which is easily compromised in today's fast moving lifestyle because the effects are not immediately exhibited. But these effects are quite well researched currently. Hence the effects of poor sleep cannot be ignored. This shift and better understanding of sleep has led to the research of finding out modalities and techniques to bring about an increase in the sleep parameters. Exercise is physical activity that is planned, structured, and repetitive for the purpose of conditioning any part of the body. Its multitude of effects includes improvement of health and maintenance of fitness. Exercises are one of the most researched behavioral modifications used to improve sleep. It has been researched as a single component as well as a part of a multimodal treatment strategy. Even after all this research the results have remained non-conclusive. This can primarily be because of the fact that the modifications possible in prescription writing are multiple. This presentation will try and throw light on these factors which are modifiable. It will also talk about the vast effects of exercises and how these effects can be used to bring about a change in the patients sleep parameters.

## ABSTRACT 51

### Abnormal motor behavior in and around sleep, in young

Garima Shukla<sup>1</sup>

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Movements during sleep are frequently observed in most people, especially in children, who are often observed by observant parents. Benign phenomena like Hypnic jerks can be mistaken for alarming events and can sometimes generate much anxiety. At the same time, there are a number of abnormal motor phenomena during sleep and at the sleep wake transition, which can be classified through careful history and confirmed through video polysomnography (vPSG) studies. These motor behaviors can broadly be divided into simple motor phenomena, characterized by stereotyped, repetitive movements and complex motor phenomena, characterized by behavioral abnormalities with more purposive appearing phenomena. Periodic limb movements, rhythmic movement disorder and epileptic seizures are common types of the simple motor phenomena and parasomnias are the main components of the complex motor phenomena category.

Details of these, their clinical and vPSG characteristics as well as the approach and management strategies will be discussed.

## ABSTRACT 52

### Obstructive Sleep Apnoea In Children

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Obstructive sleep apnea (OSA) is a disorder of breathing, during sleep, in which episodic upper airway collapse disrupts ventilation and leads to oxyhemoglobin desaturation and poor sleep quality. It is a common condition in childhood, with a prevalence rate of 1% to 5%, which can result in a range of adverse health outcomes, significant cardiovascular and neurocognitive morbidity if left untreated.

Sleep Disordered Breathing (SDB) spectrum includes primary snoring, upper airway resistance syndrome, obstructive hypoventilation syndrome and obstructive sleep apnoea syndrome (OSAS). Habitual snoring is defined as snoring for three or more nights per week. It is the commonest symptom of OSAS. Adenotonsillar hypertrophy is the most recognized risk factor of OSAS in children. Others being Allergic rhinitis and obesity. structural and/or functional abnormalities of the airway, such as micrognathia, midfacial hypoplasia, Down syndrome, Prader-Willi syndrome, achondroplasia, Pierre Robin sequence, muscular dystrophies, cerebral palsy, Chiari malformation, gastroesophageal reflux and premature birth are additional risk factors. Children with family history of OSAS are at increased risk for OSAS. Environmental tobacco smoke exposure has also been associated with snoring and OSAS. Complications of Childhood OSAS are associated with neurocognitive and cardiovascular morbidity.

Pediatric sleep medicine is a complex, dynamic, and multi-disciplinary field and the sleep specialist involved with evaluation and management of children faces an evolving landscape. Though this has emerged as a highly prevalent condition in last 30 years, there are considerable challenges in diagnosing pediatric OSA. Novel diagnostic tools need to be developed to link the physiology and biology.

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## ABSTRACTS

## YOUNG INVESTIGATORS—ABSTRACTS

## POSTER 1

**Relation of Snoring Habits with Body Mass Index and Neck Circumference Among Bangladeshi****Population**

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**Objective:** To observe the frequency of snoring and its relation with body mass index (BMI) and neck circumference (NC) among Bangladeshi adult population.

**Method:** A cross sectional study was designed among 119 adult healthy Bangladeshi population who were the accompanying persons of patients visiting the medicine outdoors of a tertiary care hospital, Chittagong, Bangladesh. A ‘Snore Survey’ questionnaire based on Berlin Questionnaire was used to find the snoring frequency. BMI was calculated as weight in kg/height<sup>2</sup> and NC was measured by placing a measuring tape just below the Adam’s apple and extending the tape horizontally around the neck. Data was analyzed by SPSS 20.

**Results:** With a valid response rate of 88.1%, 63(52.94%) male and 56(47.06%) female were recruited. Frequency of snoring was 28(23.5%) of total subjects where male snorer was 33.3% and female snorer was 12.5%. Snoring distributed from daily to monthly attacks. Some had very loud (25.0%) snoring and others also had variable loudness. Snorers had statistically significant higher level of body weight and NC ( $P < 0.001$ ) but statistically insignificant differences of height and BMI ( $P > 0.05$ )

**Conclusion** Snoring is more common in males and those having higher body weight and neck circumference among Bangladeshi adult population.

## POSTER 2

**“When I Cannot Sleep...”: Lived Experiences of People Suffering from Chronic Insomnia—a Qualitative Perspective**

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**Background:** Insomnia, being an age-old problem can be multi-factorial, tends to be chronic and debilitating to the lives of the affected. Being highly subjective in its nature, understanding the experience of ‘suffering from insomnia’ can be vital in planning interventions for them.

**Objective:** To understand the perceived needs and lived experiences of people suffering from chronic insomnia

**Methods:** The study used qualitative design with constructivist paradigm. A purposive sampling of 20 patients suffering from chronic insomnia due to various causes was obtained. Data was collected using one-to-one in-depth semi-structured interviews and then thematic analysis done.

**Results:** The overarching theme for ‘lived experiences’ came out to be ‘chronically depressed mood’ with subthemes of ‘constant worries and apprehension about sleep’, ‘monotonous lifestyle’ and ‘perceived treatment gap’. On the other hand, the main theme for ‘perceived needs’ was ‘need to be looked at like genuine patients’ with subthemes of ‘need for a new schedule’, ‘need for talking out their problem’ and ‘need for multiple medications’.

**Conclusion:** The above results clearly lay out the unpleasant experiences in the daily lives of patients with chronic insomnia, which affects functioning. In routine clinical practice, these complaints are often ignored or which creates barriers for treatment. Patient-tailored interventions are thus highly needed to reduce this common source of distress.

## POSTER 3

**NMR Based Serum Metabolic Profiling Reveals Distinctive Metabolic Signature in Obstructive Sleep Apnea**

Ravi Mishra<sup>1</sup>, Mohit Kumar Rai<sup>2</sup>, Durgesh Dubey<sup>3</sup>, Atul Rawat<sup>3</sup>, Vikas Agarwal<sup>2</sup>, Dinesh Gupta<sup>3</sup>, Zia Hashim<sup>1</sup>

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**Objective:** Metabolic profiling of sleep apnoea patients to aid rapid disease diagnosis, management and treatment monitoring.

**Methodology:** High-resolution 1D 1H NMR (nuclear magnetic resonance), CPMG spectra were acquired on sera samples collected from ( $n = 20$ ) Obstructive Sleep Apnea (OSA) along with 30 age and sex matched ( $n = 20$ ) normal controls (NC) subjects. Further, multivariate and univariate statistical analysis was used to identify and classify signature biomarkers associated with OSA.

**Results:** The sera of OSA ( $n = 20$ ) patients with biological parameter were characterized (a) by the increased levels of glucose, acetoacetate, choline, isoleucine, leucine, valine alanine, glycine, tyrosine, phenylalanine and histidine and (b) by the decreased levels of LDL/VLDL, lipids, polyunsaturated lipids (PUFA), *N*-acetyl glycoproteins (NAG), lactate, pyruvate, proline, glutamate and glutamine. Further pathway analysis revealed the perturbed metabolites are involved in multiple metabolic pathways associated with lipid, amino acid metabolism and gluconeogenesis, suggesting profoundly dampened glycolysis and  $\beta$ -oxidation.

**Conclusion:** 1H NMR-based serum metabolic profiling is a promising, non-invasive approach for rapid diagnosis and clinical management of OSA compared to other time consuming laboratory methods.

## POSTER 4

**Sleep Problems Among Research Scholars**

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**Objectives:** (a) To assess if restricted sleep and poor quality sleep of research students impact their performance of simple cognitive tasks

such as Psychomotor Vigilance Task (PVT). (b) To investigate whether more complex behaviour such as working on deadlines, pro sociality and being adaptive are affected in the same way as simple tasks by restricted and poor quality sleep.

**Methods:** The Psychomotor Vigilance Test (PVT)

**Results:** The reported average hours of sleep of the participants were 7.76 h, and the reported quality of sleep was 0.82 that indicates good quality sleep as per PSQI. The recorded average of lapses was 9.34. According to the interpretation of the scores in the Psychometric Vigilance Test, any score above 3 is said to be indicative of poor sleep, thus it can be assumed that the entire sample is experiencing poor sleep. From the details of lapses, it is indicated that less than 11% of the population have got a score of 3 or below in the Psychometric Vigilance Test. This indicates that the other 89% of the population are experiencing poor sleep.

**Conclusion:** Sleep deprivation is a common problem in the young adult college student population. It is expected to be higher among research scholars who work on different deadlines (Rugulies et al. 2012).

## POSTER 6

### Non Action Video Game Training Improves Sleep Quality and Cognitive Functions in Collegiate Students

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**Objectives:** We investigated the effects of non-action video game training on sleep quality and cognitive functions in sleep disturbed collegiate students.

**Methods:** The current study has ethical clearance and not supported by any funding agency. 30 sleep disturbed collegiate students were randomly assigned into two groups, experimental and control. The subjects in experimental group completed 4 week, computerized non-action video game training, while those in control group were refrained from playing video games during the study. Pre and post training, all subjects were assessed for their sleep quality using Pittsburgh Sleep Quality Index (PSQI) and Epworth Sleepiness Scale (ESS). Cognitive functions were tested using PennCNB, computerized neuropsychological battery given by University of Pennsylvania. Electrophysiological correlates of cognition were evaluated by P300 evoked potential using auditory odd ball paradigm.

**Results:** We found significant decrease in both PSQI and ESS scores in experimental group as compared to control. There was an improvement in reaction time, visual memory and logical reasoning on PennCNB in videogame learners as compared to control. The P300 data showed a decrease in latency and increase in amplitude with video game training in sleep disturbed students.

**Conclusion:** The present study showed that 4 week of non-action video game training improved sleep quality and cognitive functions in sleep disturbed collegiate students.

## POSTER 7

### Cognitive Retraining Ameliorates Sleep Deprivation Induced Behavioural Deficits in University Students

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Sleep deprivation is highly prevalent among students which lead to deleterious consequences on learning, memory, mood and behaviour.

We use videogame cognitive retraining to restore the sleep deprivation induced behavioral dysfunctions in university students. The study was a randomized controlled type where participants were assigned to one of two groups: VG (Videogamers) or NVG (Non-videogamers). University students were screened for sleep deprivation using Pittsburgh Sleep Quality Index (PSQI). They were given cognitive retraining for 30 min each day for 4 week intervention period. Study outcome measures were obtained at baseline and after the cognitive retraining. Participant's general affect and behaviour was measured by positive affect and negative affect scale (PANAS). PennCNB, computerized neuropsychological battery was used to evaluate their cognitive functions.

The result of present study showed a significant increase in negative affect and decrease in positive affect in sleep deprived individuals. Cognitive retraining for 4 weeks reverses these sleep deprivation induced mood disturbances in university students. Sleep deprivation also showed a significant and marked impairment in given neuropsychological tests. However, cognitive restoration was achieved in VG group as compared to NVG group.

The study indicates that 4 week of video game cognitive retraining ameliorates sleep deprivation induced cognitive and mood disturbances in university students.

## POSTER 8

### Sleep Quality and its Effect on Illness Course in Bipolar I Disorder

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**Objectives:** Sleep disturbances are frequent during acute and remitted phases of bipolar disorder. Poor sleep quality begets morbid illness outcome. The study aimed to assess the sleep quality and its effect on illness course in bipolar I disorder (BD-I) patients. The association among sleep quality, adherence and suicide risk was elucidated.

**Methods:** Patients with BD-I (N = 150), were recruited and their diagnoses confirmed using the Structured Clinical Interview for DSM-IV-TR. Only remitted patients (n = 103) were taken for the analyses. Conventional tools such as the NIMH-Life-Chart Methodology (Retrospective), the Pittsburgh Sleep Quality Index, the Columbia Suicide Severity Rating Scale, and the Medication Adherence Rating Scale were used to assess the illness course, sleep quality, suicide behaviour and adherence attitudes, respectively. The “adequate sleepers” and “poor sleepers” were compared along various parameters.

**Results:** About 40% of remitted patients had impaired sleep quality. The illness course was similar between “poor” and “adequate” sleepers. The former exhibited poor adherence attitudes and greater suicidal risk (17 vs. 6,  $p < 0.001$ ) than the latter.

**Conclusions:** Impaired sleep quality in remitted patients leads to poor adherence attitudes and greater suicidal risk. Active efforts are needed to address sleep problems during the inter-episodic period of BD.

**Funding:** No funding was involved.

**Ethical clearance:** Obtained from the Institute Ethics Committee.

## POSTER 9

### Cardiac Autonomic Response Latency as an Early Predictor of Autonomic Dysregulation in Sleep Deprived Type2 Diabetes Mellitus Patients

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**Background:** Diabetes mellitus (DM) a condition affecting a large population worldwide. DM also exerts a negative impact on patient’s sleep quality. There is a correlation between autonomic functions, sleep pattern and sleep duration. The present study was designed to study the cardiac autonomic reactivity test (CART) in general and cardiac autonomic response latency in particular.

**Methods:** Subjects were questioned about their average sleep duration and divided into two groups; Group 1 (n = 13) with sleep duration >7 h and Group 2 (n = 9) with sleep duration <7 h. Cardiac Autonomic reactivity test (CART) was assessed. The latency parameter and recovery time for lying to standing test (LST) and valsalva was measured.

**Results:** We did not find any significant difference in any of the reactivity tests. Even peak tachycardia latency of LST and valsalva challenge was statistically non-significant. But it was observed that the recovery time (bradycardia latency) during LST was significantly high in Group 2 patients. Although not significant, there was a trend of an increase in recovery time during valsalva manoeuvre in Group 2 as compare to Group 1.

**Conclusion:** So we conclude that cardiac autonomic latency parameters can be an early predictor of autonomic disturbance in T2DM, who have a shorter duration of sleep. Delayed recovery may suggest a prolonged autonomic response to bring back the set point after cardiovascular reflex testing.

**Keywords:** Cardiac Autonomic latency, DM, Sleep

## POSTER 10

### Sleeping Late and Sleeping Less Affects Body Mass Index in Adolescent

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**Objectives:** During adolescence, there is a tendency to sleep late and sleep less due to altered psychosocial and life-style changes. Study was done keeping in mind objective to see the effect of sleeping late and sleeping less on body mass index (BMI) in the medical college freshmen separately in boys and girls.

**Materials and Methods:** All the subjects (n = 142, boys = 104, girls = 38) were adolescents (mean age  $17.77 \pm 0.79$  years). After informed consent they filled out a questionnaire about their sleeping habits. Height and weight were measured after a brief history and clinical examination.

**Results:** The results show that girls went to bed early (11:09 pm vs 11:36 pm,  $p = 0.011$ ) and woke up early (6:26 am vs 6:49 am,  $p = 0.03$ ) as compared to boys. The BMI increased significantly with decrease in total sleep duration and with delay in bed time. Those sleeping late (after 12 am) had significantly less sleep duration (6.78 vs 7.74 h,  $p < 0.001$ ), more day time sleepiness (85.2 vs 69.3%,  $p = 0.033$ ) and more gap between dinner time and going to sleep (234.16 min vs 155.45 min,  $p < 0.001$ ). Late sleepers having increased BMI may be explained by low physical activity in day due to excess sleepiness.

**Conclusion:** Sleep habits of sleeping late and sleeping less contributes to increase BMI in adolescent boys and girls. Thus in adolescents focus must also be on nurturing healthy sleep habits, apart from guidance for diet and exercise, for the prevention of obesity in adulthood.

## POSTER 11

### Cardiovascular Autonomic Dysfunction and Obstructive Sleep Apnoea: a Correlation

Dr. Manisha Mavai<sup>1</sup>, Yogendra Raj Singh<sup>1</sup>, Anish Singhal<sup>1</sup>, Suresh Ravichandran<sup>2</sup>, Neetu Srivastava<sup>2</sup>, Rajesh Kumar Sharma<sup>2</sup>

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**Objectives:** The autonomic nervous system (ANS) regulates body visceral functions and controls vital functions to maintain homeostasis. It is well-known that ANS activity is influenced by sleep and behavior of autonomic function varies with sleep stages. Sleep controls major body functions and its disruption causes organ dysfunction. Obstructive sleep apnea (OSA) is the most common sleep disorder. OSA is primarily with unknown etiology and is also linked to contributing factors. Autonomic changes occurring in OSA are generally secondary. The hemodynamic changes which occur in OSA are associated with increased sympathetic tone and altered vagal activity. The objective of this review was to investigate how OSA and

its components correlate with deranged autonomic activity in general and especially with cardiovascular autonomic dysfunctions.

**Method:** This article is a review of the published papers on the cardiovascular autonomic dysfunctions in OSA. The search was performed on Pubmed, Scopus, other relevant databases and books by searching appropriate key words.

**Result:** The abnormalities in autonomic functions may predispose obstructive sleep apnoea to cardiovascular diseases. It is also found to be responsible for the increased risk of complications like hypertension & cardiac arrhythmias in OSA.

**Conclusion:** Cardiovascular dysfunctions are prevalent in OSA and may occur in early stage of disease with significant cardiovascular morbidity.

**Keywords:** Obstructive Sleep Apnoea, Autonomic dysfunctions

## POSTER 12

### Assessment of Perioperative Difficult Airway Among Undiagnosed Obstructive Sleep Apnea (OSA) Patients Undergoing Elective Surgery: a Prospective Cohort Study

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**Objectives:** To estimate the occurrence and compare utility of OSA screening parameters in predicting difficult mask ventilation and intubation in patients with undiagnosed OSA.

**Methods:** A prospective observational study was conducted in a tertiary care centre in patients undergoing elective surgery. STOP-BANG questionnaire was administered preoperatively along with collection of demographic data and airway assessment. Population was divided into OSA and NON-OSA group based on STOPBANG score >3. Occurrence of difficult mask ventilation (DMV), laryngoscopy(DL) and intubation(DIT) was compared between both groups using DMV score, corneck lehane grading and IDS score respectively. SPSS 21 was used for data analysis.

**Results:** A total 54 patients in OSA and 46 patients in non OSA group were studied. 49 cases of DMV, 14 cases of DIT and 25 cases of DL were encountered. In OSA group there was 77.7% DMV, 22.2% DIT and 33.3% DL. History of snoring had highest sensitivity and negative predictive value while history of apnea, BMI > 35, SACS score had highest specificity in determining occurrence of difficult airway.

**Conclusion:** OSA is associated with difficult airway management. Apart from usual airway assessment and anthropometry history of snoring and screening for OSA is important in recognition of difficult airway. The increase in the rates of difficult airway among high OSA risk patients warrants use of screening tools for triage.

## POSTER 13

### The Consolidation of Contextual Fear Memory Requires the Optimal Expression of Plasticity Related Genes in the Hippocampus and Decreased REM Sleep

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The expression of formin-2 (Fmn2), glycogen synthase kinase 3 alpha (Gsk3 $\alpha$ ), neurochondrin (Ncdn) and SH3-ankyrin repeat domain gene 3 (Shank3) and sleep architecture changes after contextual fear conditioning (CxFC). However, their role in the consolidation of CxFC memory is not known.

**Objectives:** We studied the role of these genes in the consolidation of CxFC memory and the associated changes in the sleep architecture.

**Methods:** Male Swiss mice were prepared for chronic polysomnographic recordings and siRNAs microinjection in the dorsal hippocampus. siRNAs of Fmn2, Gsk3 $\alpha$ , Ncdn and Shank3 were injected soon after CxFC. The effects on memory were tested 24 h later. The protocols were approved by IAEC, JNU, New Delhi.

**Results:** siRNA microinjections impaired CxFC memory. The animals in siRNA-Fmn2, siRNA-Gsk3 $\alpha$ , siRNA-Ncdn and siRNA-Shank3 groups exhibited 77.54% ( $p < 0.001$ ), 68.77% ( $p < 0.01$ ), 71.51% ( $p < 0.01$ ) and 87.32% ( $p < 0.001$ ) less freezing compared to the control group. Further, REM sleep significantly decreased in the memory-consolidated groups on the training and testing days. Interestingly, it did not change in the memory-impaired groups (siRNA knockdown groups).

**Conclusions:** The results demonstrate that Fmn2, Gsk3 $\alpha$ , Ncdn and Shank3 are possible memory candidate genes for CxFC memory. Further, it also suggests that REM sleep possibly acts as a negative modulator in the consolidation of fear memory.

Funding from DBT and CSIR is highly acknowledged.

## POSTER 14

### PKA and WNT Pathways in the Amygdala Modulate Sleep Dependent Consolidation of Appetitive Delay-Conditioned Memory in the Rat

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REM sleep significantly increased after appetitive delay-conditioning, and short-term sleep deprivation alters this memory. How sleep influences the consolidation of appetitive delay-conditioned memory is not known.

**Objectives:** We studied the role of PKA and Wnt signaling pathways in sleep dependent consolidation of appetitive delay-conditioned memory.

**Methods:** Male Wistar rats ( $n = 42$ ) were prepared for polysomnographic recordings and microinjections of anisomycin, Rp-cAMP and DKK-1 in the amygdala. Drugs were injected soon after training, and its effects on memory were tested 24 h later. The changes in PKA, ERK and CREB expressions ( $n = 40$ ) were investigated 4 h after the injections. All protocols were approved by IAEC, JNU, New Delhi.

**Results:** Microinjection of anisomycin, Rp-cAMP, and DKK-1 significantly induced memory deficit. Compared to the controls, ANI, PKA and DKK1, animals showed 84.06, 56.23 and 51.44%, less head entries ( $p < 0.001$ ) during testing. REM sleep significantly increased in memory-consolidated groups but did not increase in memory-impaired groups. Further, we observed that these drugs reduced the phosphorylated PKA, ERK and CREB levels in the amygdala. However, we did not get consistent changes in the level of total PKA, ERK and CREB proteins.

**Conclusions:** Our results suggest that PKA and Wnt signaling pathways play an important role in the consolidation sleep dependent delay-conditioned memory.

Funding from DBT and DST is acknowledged.

## POSTER 14

### REM Sleep Deprivation Decreases Appetitive Trace-Conditioning Induced Hippocampal Adult Neurogenesis

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Short- and long-term total sleep deprivation, as well as prolonged REM sleep deprivation (REMSD), alters learning induced hippocampal adult neurogenesis. However, the effects of acute REMSD on learning induced hippocampal neuronal proliferation are not known.

**Objectives:** We studied the effects of (a) hippocampal-dependent appetitive trace-conditioning and (b) the detrimental effects of 24 h REMSD on the hippocampal neural proliferation.

**Methods:** Rats were trained for hippocampal and non-hippocampal-dependent trace and delay conditioning tasks after injecting BrdU (100 mg/kg) (i.p. injections for 3 consecutive days). Number of proliferating (BrdU +ve) cells was estimated through immunohistochemistry. The REMSD animals were deprived using a modified multiple platform method for 24 h soon after trace conditioning. All protocols were approved by IAEC, JNU, New Delhi.

**Results:** Trace and delay conditioned animals exhibited significant conditioning response on the testing day. Interestingly, the number of proliferating cells was significantly high (100.17%,  $p < 0.001$ ) in the trace-conditioned animals, the delay-conditioned animals, however, did not show increased proliferation (compared to the untrained animals). The proliferating cells were 84% less in the REMSD animals (compared to non-REMSD).

**Conclusions:** These results suggest that REM sleep plays an important role in the maintenance of training induce hippocampal neuronal proliferation.

Funding from DBT is highly acknowledged.

## POSTER 16

### Multimodal Physiotherapy Improves Pain, Sleep Quality and Health Related Quality of Life in Chronic Mechanical Neck Pain Patients

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**Objectives:** Mechanical neck pain (MNP) patients are found to have altered sleep quality and health related quality of life which are important subjective measures reflecting wellbeing of an individual. So, we investigate the effects of multimodal physiotherapy on pain, sleep quality and health-related quality of life (HRQoL) in patients with chronic MNP.

**Methods:** The current study was approved by the Institutional Ethical Committee and not funded by any agency. 30 patients were randomly assigned into two groups, experimental and control. Experimental group received supervised physiotherapy and the control group received minimal intervention as home program. Pain was assessed by numerical pain rating scale (NPRS). Sleep quality and HRQoL were assessed by Insomnia severity scale (ISI) and RAND SF-36 questionnaires respectively. All the outcome measures for both the groups were collected at baseline, 4 and 8 weeks after the intervention.

**Results:** We found statistically significant difference in NPRS, ISI and Rand SF-36 scores at 4 weeks as well as after 8 weeks in experimental group than the control group.

**Conclusions:** The present study suggests that 8 weeks of multimodal physiotherapy resulted in significant improvement in pain, sleep quality and HRQoL in chronic MNP patients.

## POSTER 17

### Comparison OF Epworth Sleepiness Score AND Berlin Questionnaire as Screening Tool for OSA Patients

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**Aims and Objective:** ESS and B.Q. are commonly used pre assessment tools for OSA. We compared their sensitivity in patients subsequently found to have OSA.

**Materials and Methods:** Study was conducted at Department of Respiratory Medicine, JLN Ajmer. Total 72 patients presenting with

symptoms of OSA like excessive day time sleepiness, snoring, unrefreshing sleep, tiredness etc., were asked to fill up both ESS and B.Q. Subsequently all such patients underwent level 1 Polysomnography at sleep lab of our department.

**Result:** We found that 32 patients (71.11%) were diagnosed as OSA by using B.Q. while only 14 patients (31.11%) were diagnosed as OSA by using ESS. This difference was statistically significant ( $p$  value 0.000004). Sensitivity of ESS was 40.16%, specificity was 87.88%, positive predictive value was 75% and negative predictive value was 62.16%. As comparison to ESS sensitivity of BQ was 71.56%, specificity was 86.22%, positive predictive value was 80% and negative predictive value was 77.67%.

**Conclusion:** In our study we found that B.Q was more valuable screening test for assessment of patients for OSA. ESS is entirely depend on patients symptoms and history and it is only a subjective test, While B.Q is an objective test, were we assess Body Mass Index and Blood Pressure also, making it more sensitive and useful than ESS. If we choose only ESS as screening tool we could have missed 31 patients, who also had otherwise OSA.

## POSTER 18

### The Compensatory Contextual Fear-Conditioning and its Influence on REM Sleep

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Contextual fear memory (Conxt-FC) can be formed with multiple training in the absence of dorsal hippocampus (DH). However, at what time point the compensatory mechanisms emerge, remains elusive. Further, REM sleep acts as a negative modulator for encoding Conxt-FC memory, but its role in compensatory Conxt-FC is not known.

**Objectives:** We determined a minimum necessary time period for the emergence of compensatory Conxt-FC, and its influence on REM sleep.

**Methods:** Male Wistar rats ( $n = 30$ ) were prepared for chronic polysomnographic recordings and ibotenic acid microinjections in the DH. DH-lesioned and non-lesioned animals were trained and tested twice for Conxt-FC (1st training: 2 days after lesioning; 2nd training: 1 day/3 days after 1st testing). The induced freezing response was calculated on testing and re-testing days. All procedures were approved by IAEC, JNU, New Delhi.

**Results:** The DH-lesioned animals re-trained on 3 days showed significant increased freezing response (77.60%;  $p < 0.05$ ) compared to the animals re-trained on 1 day. Further, DH non-lesioned animals showed decreased REM sleep on training and testing days, but interestingly, it did not decrease after re-training and re-testing in the DH-lesioned animals.

**Conclusions:** Our results suggest that the compensatory circuits develop within 3 days from the first conditioning trial. It further suggests that REM sleep may not be acting as a negative modulator in the compensatory Conxt-FC.

\*Funding from DBT and ICMR is acknowledged.

## POSTER 19

### Unraveling the Circadian Variations of Melatonin and Cortisol in Women with Fibromyalgia Syndrome: Implications to Disease Manifestations

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**Objective:** The aim of the present study was to evaluate circadian variation in serum melatonin and cortisol levels and correlate it with Tender Points Count (TPC) and Fibromyalgia Impact Questionnaire Revised (FIQR) in women with Fibromyalgia Syndrome (FMS).

**Method:** Serum levels of cortisol and melatonin were measured at 6 h intervals of the day (0600, 1200, 1800 and 0000 h) in 50 women with FMS satisfying American College of Rheumatology (ACR) 1990 criteria as well as 50 healthy control women.

**Result:** Significantly higher melatonin levels were observed in the patient group in morning hours, whereas a significantly lower level of melatonin was found during the night time in the patient group than in the control group. Moreover, significantly higher values were obtained in the evening and night time serum cortisol levels among the patients compared with controls. Further, when the mean values of cortisol throughout the day were tested among patient and control groups similar circadian rhythm was found. The only difference being that serum cortisol declined much more in controls in evening and night samples as compared with FMS women.

**Conclusion:** We conclude that circadian variations exist in the circulating levels of serum cortisol and melatonin in women with FMS. Low levels of melatonin secretion during night may contribute to the pervasive sleep disruption and increased pain perception.

## POSTER 20

### Correlation of Snoring Intensity with Severity of Obstructive Sleep Apnea

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**Objectives:** It is usually believed that louder snoring is associated with more severe obstructive sleep apnea(OSA), but studies are limited and the relationship of snoring intensity and severity of OSA has not been systematically investigated.

In the present study we are evaluating the association between snoring intensity and the severity of OSA to better understand their clinical correlation.

**Methods:** The study included 20 subjects who were > 18 years of age. Overnight polysomnography (PSG), including objective measurement of snoring intensity were planned. Subjects were excluded if they had undergone upper airway or neck surgery, or if they were using continuous positive airway pressure or an oral appliance during night. The severity of OSA was determined from the apnea–hypopnea index (AHI) for total sleep time. The intensity of snoring was measured during PSG. We used the mean maximum decibel level to classify snoring as mild (40–50 db), moderate (50–60 db) and severe (> 60 db).

**Results:** PSG of 10 subjects were analysed. We found following trends, 4 subjects with mild snoring intensity have no OSA, 4 subjects showed moderate snoring intensity, 3 of them have moderate OSA and 1 have no OSA, 2 subjects showed severe snoring intensity, 1 among them presented with very severe OSA and another one presented with severe OSA. Final results will be discussed at the conference.

**Conclusion:** The intensity of snoring increases as OSA becomes more severe.

## POSTER 21

### Sleep Quality and its Relation with Body Mass Index: a Study Conducted at MKCG Medical College, Berhampur, Odisha

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**Background:** Obesity is a major health problem worldwide and is the most common modifiable risk factor for many diseases. Many studies suggest that obesity is influenced by sleep disturbances. College is a time marked by change, when many students experience autonomy and freedom from direct supervision for the first time, greater academic and social pressures, and erratic schedules. Major changes in lifestyle and lack of sleep can be detrimental to the students' well-being.

**Objective:** To assess the sleep quality and to find its relationship on body mass index (BMI)

**Methods:** It is a cross-sectional study conducted among first year MBBS students of MKCG Medical College, Berhampur, Odisha. The study was conducted during the month of December 2016 to February 2017. Those students willing to participate in the study were included and those having diabetes, hypertension were excluded from the study. A total number of 202 medical students were examined. BMI was calculated using Quetlets formula and categorized into normal, overweight and obese (WHO criteria). Sleep quality was assessed using Pittsburgh sleep quality index (PSQI) score.

**Results:** 53% of students who were poor sleepers had elevated BMI whereas 16% of good sleepers had elevated BMI.

**Conclusion:** The elevated BMI may be due to poor sleep quality. Because sleep quality is a potentially modifiable risk factor, these findings might have important clinical implications for prevention and treatment of obesity.

## POSTER 22

### Mouse Model of Chronic Sleep Disruption Induces Mania like Behavior

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Sleep, the restorative process of the body plays major role in well-being of human. Inadequate sleep leads to disturbance of homeostasis and results in development of gastrointestinal, cardiovascular and neuronal pathologies etc.

The current study aims to explore the effects of chronic sleep disruption, with particular focus on elucidating possible neurobehavioral alterations. Chronic sleep disruption for a period of 9 weeks employing modified multiple platform model to induce paradoxical sleep alterations for 8 h. from Monday to Friday with recovery sleep at the weekend was employed to study the neurobehavioral alterations. Adult female Laca mice were used after the approval from Institutional Animal Ethical Committee (IAEC). Assessments of neurobehavioral changes were done using open field test, actophotometer, zero maze and stereotypic scoring.

Neurobehavioral testing demonstrated mania like behavior denoted by hyperlocomotion, increased exploratory activity and marked stereotypic behavior (popping, rearing, grooming, jumping, licking). To the best of our knowledge, this is the first study reporting manifestation of 'Mania like behavior after chronic sleep disruption.

These findings have strong relevance for people working at various shift schedules such as security personnel, nurses, doctors etc. and also pave the way for testable hypotheses concerning possible underlying mechanisms.

UGC RFSMS is gratefully acknowledged for the support.

## POSTER 23

### Sleep Hygiene in a Tertiary Care Hospital in South India. Cause for Concern or not?

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**Objective:** To study the sleep hygiene of the doctors of a tertiary care hospital in south India.

**Methods:** After ethical clearance and informed consent, doctors (age: 20–40y) participated in the study by answering the Epworth Sleepiness Scale (ESS) questionnaire and maintaining a sleep diary for 2 weeks. The total sleep duration (TSD), sleep latency (SL) and subjective quality of sleep were obtained. The data was summarized

using mean(SD)/median(IQR) for continuous variables and analysed using the Mann–Whitney *U* test.

**Results:** The mean (SD) age, TSD and SL of the 47 volunteers (36 junior doctors; 11 senior doctors) was 29.47 (4.35) years, 6.28 (0.91) h and 11.17 (7.58) min respectively. The median (IQR) ESS score was 8 (5, 10). The reporting of feeling of 'fatigued' was significantly more in the junior doctors (median 3/14 days; IQR 0,4.5) compared to the senior doctors (median 0/14 days; IQR 0,0) ( $p = 0.02$ ).

**Conclusions:** The tertiary care hospital doctors in our study, sleep less on an average than the standard recommendation of  $\geq 7$  h by the American Academy of Sleep Medicine. An intensive work schedule, not allowing for any daytime sleepiness, could explain our finding of only 25% reporting an ESS score of  $>10$ . It is a cause of concern that the junior doctors report a poor quality of sleep which warrants further exploration.

**Acknowledgement:** Funded by Fluid Research Grant, Christian Medical College, Vellore.

## POSTER 25

### Association of Sleep with Autonomic Function in first year Medical Students

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**Objectives:** To determine the relation between sleep with autonomic function in First Year Medical Students.

**Methods:** A non-experimental, cross sectional study was done on randomly selected 60 (30 boys and 30 girls) voluntarily participating students of our college of age group 17–18 years after the approval of the Human Research Ethics Committee of our institute. The sleep parameters were assessed by using Pittsburgh Sleep Quality Index (PSQI) and the autonomic functions were assessed by frequency domain (High Frequency-HF, Low Frequency-LF, LF/HF ratio) measures of heart rate variability (HRV). The observations of the study were analyzed after grouping them into Good sleeper (PSQI Global score  $<5$ ) and Poor Sleepers (PSQI Global score  $\geq 5$ ).

**Results:** The rate of poor sleep quality was found 20% in boys and 10% in girls according to PSQI global score ( $\geq 5$ ). Although no significant difference was found in parameters of HRV (LF, HF, LF/HF ratio) between good sleepers and poor sleepers, LF/HF ratio was higher in poor sleepers than good sleepers in both boys and girls. Sleep disturbance shows significant positive low correlation with LF ( $r = 0.47$ ,  $p = 0.00$ ), LH/HF ratio ( $r = 0.47$ ,  $p = 0.00$ ) and significant negative correlation with HFn.u. ( $r = -0.47$ ,  $p = 0.00$ ) in boys. While in girls, sleep duration shows low positive correlation with LH/HF ratio ( $r = 0.35$ ,  $p = 0.05$ ).

**Conclusion:** The current study indicates that sleep affects the autonomic functions of the First year medical students.

## POSTER 27

### Mobile Phone Usage—a Major Cause of Sleep Deprivation in the Medical Undergraduates

Dr Rituparna Barooah<sup>1</sup>, Demewe U Ritse<sup>2</sup>; Aniket Goswami<sup>2</sup>; Rabina Pukhrambam<sup>2</sup>; Jubair Ahmed Barbhuiya<sup>2</sup>; Michi Anthony<sup>2</sup>

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1. To identify the prevalence of sleep deprivation among the 1st year MBBS students of North Eastern Indira Gandhi Regional Institute of Health and Medical Sciences (NEIGRIHMS), Shillong
2. to estimate the duration and frequency of mobile phone usage among the students.

**Methods:** Participants were selected from the first year MBBS students of NEIGRIHMS, Shillong consenting to be the part of the study. Data was collected through a well validated questionnaire that comprised of data acquisition on frequency, duration, usage time and purpose of the mobile phone usage. Questions on self-reported tiredness was also included. Ethical clearance was exempted.

**Results:** 51.1% of the participants were male and 48.8% were female. The average age was 20 years. 51.6% used mobile phones  $>3$  h and 22.5% each for 2–3 h and 1–2 h. All the subjects used phones mostly during night. Majority of subjects reported of being less motivated to do activities which they earlier look forward to and felt that they have inadequate time to finish their work which was reflected on late submission of assignments and absenteeism in the first class.

**Conclusion:** Mobile phone usage beyond 3 h especially at night was the major factor behind a sleep deprivation of around 5–6 h. which is often detrimental to optimal academic performance. A timely management of mobile phone usage is recommended in order to avoid sleep deprivation.

**Acknowledgement:** Funding was not sought.

## POSTER 28

### Does Stimuli Valence Effect False Memory Recognition in Deese-Roediger-Mcdermott (DRM) Paradigm ?

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**Objectives:** In the present study, we propose to study whether stimuli valence modulates false memory recognition using the DRM paradigm.

**Methods:** 23 healthy males (age range: 18–25 years) volunteered for the experiment. Valence words were extracted from ANEW served as stimuli. Total 6 lists of 12 words in each were presented to the subjects with instruction to attend each word and be prepared for a later

recognition. At recognition, participants performed old/new task. Each recognition list contained two old words (learning list), two unrelated words and two weakly associated words (intrusions) and one critical lure word. A distractor task was introduced between study and recognition phases to prevent the repetition of lists. Two-tailed independent t test with 0.05 significance level was used to analyze data. We are presently validating the results of the present study across sleep and sleep deprived subjects.

**Results:** Positive old words were better recognized [(t (22) = -3.44,  $p < 0.05$ )]. Similarly, negative intrusions were significantly more than positive intrusions [(t (22) = 2.46,  $p < 0.05$ )]. Critical lure recognition across stimuli valence turned to be non-significant [(t (22) = 0.24,  $p > 0.8$ )]. Preliminary results from the sleep study suggest sleep following learning leads to lesser false memory recognitions.

**Conclusions:** No difference in the recognition of critical lures across stimuli valence suggests false memory recognitions are not influenced by stimuli valence.

## POSTER 29

### Sleep Quality Determined by Occupational Stress Among Professional Drivers in Jodhpur, Rajasthan: a Pilot Study

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**Objective:** Professional drivers have ambiguous work hours leading to stress and impaired sleep quality. The objective of this pilot study was to assess impaired sleep quality among professional drivers due to occupational stress.

**Methodology:** Cross sectional survey was conducted among professional drivers employ where occupational stress was assessed through Occupation Stress Index (OSI) scale while sleep quality was determined by Pittsburgh sleep quality questionnaire (PSQI).

**Results:** Out of seven domains of OSI, investigator analyzed study subjects on 3 domains till the time of abstract submission. These were: under load, high demand and extrinsic time pressure and correlated these 3 domains with sleep quality of study subjects. It was observed that Global PSQI scores has positive correlation with Total under load score ( $r = 0.11$ ); total high demand score ( $r = 0.18$ ) and total extrinsic time pressure (0.41). Thus increase in under load, high demand and extrinsic time pressure in occupation lead to poor sleep quality among professional drivers.

**Conclusion:** Occupational stress due to under load, high demand and extrinsic time pressure impairs sleep quality among professional drivers. Appropriate strategic interventions are needed at managerial level to modify these factors.

## POSTER 30

### A Study of Sleep Problems, Quality of Life and Physical Function Among Adults in Low and Middle-Income Countries

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Sleep problems represent an unrecognized public health issue. This study examines association of sleep problems with quality of life and physical function in six such countries namely India, China, Ghana, Mexico, Russia and South Africa. The study is based on WHO Study on global Ageing and adult health (SAGE) wave-1(2007-10) data.

The association between self-reported sleep problems (insomnia, sleep duration and quality of sleep) and Quality of life (QOL) was estimated by linear regression with multiple variables. In India, those who reported insomnia have 3.32 lower quality of life score; while in China it lowers the quality of life score by 2.34. It can be observed across all the countries that poor quality of sleep leads to lower QOL score. Insomnia is the strongest predictor of Activities of daily living (ADL) across all the countries. People having poor quality of sleep are more likely to report disability in all the countries. The association between insomnia and Instrumental Activities of Daily Living (IADL) is the strongest and it can be seen across all the countries except Mexico. Poor quality of sleep is significantly associated with IADL only in Russia and South Africa.

The study shows that sleep problems are strongly associated with quality of life and physical functioning and have adverse effect on it. Therefore, sleep problems should be considered as an important factor in assessing the health of adults and measures should be taken to reduce the sleep problems.

## POSTER 31

### Association Between Obesity and use of Electronic Devices; Sleep Duration and Quality; Academic Performance in Medical Students

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**Background:** Advanced technology and multiple device use may link to increased body mass index (BMI). The sleep-obesity relationship is inconsistent in adolescents. Sleep duration and quality may have crucial connections to obesity development, particularly in medical

students (adolescents) where sleep alterations are common. Elevated BMI in adolescents may influence academic performance and aspiration.

**Objectives:** The objectives of this study were to assess the linear associations between BMI and (i) quantity/type of electronic devices used; (ii) sleep quantity/quality and (iii) academic performance/aspiration in medical students.

**Methods:** Medical students between the age groups 18–21 yrs were recruited & Questionnaire were administered. Objective measures of height/weight were obtained to calculate the BMI.

**Results:** Use of electronic devices was significantly associated with BMI (obesity). Those who always engaged in video gaming and mobile phones had significantly higher BMI vs. never-users,  $P < 0.001$ . Weekday sleep duration and sleep onset latency were related to BMI,  $P < 0.001$ , respectively. An inverse linear association was observed between BMI and academic performance,  $P < 0.001$ .

**Conclusions:** Reducing bedtime use of electronic devices and improving sleep hygiene in adolescents could be an achievable intervention for attenuating obesity with potentially positive effects on academic performance.

## POSTER 32

### Intracerebral Glutamate Injection at Lateral Mediodorsal Thalamic Nuclei Produces Wakefulness

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**Objective:** To record sleep after stimulation of lateral mediodorsal thalamus nuclei (MDI) by L-glutamate

**Materials and Methods:** The present study was done as per the guidelines of the institutional ethics committee, AIIMS and Committee for the purpose of control and supervision of experiments on animals (CPCSEA). Six male wistar rats chronically implanted with EEG, EOG and EMG electrodes received bilateral L-glutamate microinjection (60 ng/200 nl of saline) at lateral segment of MDI through the guide cannula implanted 2 mm above it. Rat sleep–wake cycle was recorded for 6 h. Three baseline recordings taken before microinjection served as time matched control. On the day of microinjection, 2 h of baseline recordings were taken prior to the glutamate injection. Post injection recordings were continued for 4 h. From the rat polysomnogram, the percentage values of total sleep time (TST), total wake time (TWT), total slow wave sleep (SWS), total paradoxical sleep (TPS) were calculated in each 1 h. The three baseline recordings were averaged and time match comparisons were made. The values of pre and post microinjections were also compared and analyzed.

**Results:** There was an increase in wakefulness after L-glutamate microinjection. The increase was statistically significant ( $P < 0.05$ ) along with significant reduction in TST.

**Conclusion:** Glutamatergic excitation of MDI resulted in prolonged wakefulness. MD may play a prominent role in maintaining thalamocortical arousal.

## POSTER 33

### Pickwickian Syndrome

Dr. Suman Shil<sup>1</sup>, Dr. A. S Pandey<sup>2</sup>, Dr. Pankaj Mittal<sup>3</sup>, Dr. Dhruv Patel<sup>4</sup>

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OHS is defined as the combined presence of obesity (BMI  $>30$  kg/m<sup>2</sup>) with awake arterial hypercapnia (PaCO<sub>2</sub>  $>45$  mmHg) in the absence of other causes of hypoventilation. Patients may present with symptoms such as excessive daytime sleepiness, fatigue, or morning headaches, which are similar to symptoms seen in obstructive sleep apnea–hypopnea syndrome.

**Case Report:** We report a case of 62 year old obese female patient who presented to the opd with history of excessive day time somnolence, fall asleep anywhere anytime, increase in weight, poor performance at work, shortness of breath, frequent arousal during sleep since last 6 months. Diagnosis was made on the basis of history, clinical examination, sleep study, exclusion criteria and diagnosed with Pickwickian syndrome. Patient was kept on ventilatory support in ICU for 8 days but then failed to recover and collapsed.

**Conclusion:** OHS is a complex, multifactorial disorder necessitating a comprehensive management approach. Although PAP therapy can effectively abolish sleep-disordered breathing, unload the respiratory muscles, reduce the work of breathing, and improve ventilatory drive, it appears to have little impact on the excess cardiovascular risk and comorbidity associated with persisting obesity. In particular, it is important to determine whether instituting a comprehensive therapy package in those at risk for developing overt OHS improves health outcomes and survival.

## POSTER 34

### Assessment of Cardiovascular Autonomic tone and Sleep Duration in Type 2 Diabetes Mellitus Patients

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**Objectives:** The incidence of type 2 diabetes mellitus (T2DM) has been increasing in recent years. There is mounting evidence to show an association between sleep deprivation, sleep disorders and Type 2 DM. Sleep–wake cycle irregularities are more common in T2DM subjects but, little is known about autonomic irregularities in sleep deprived T2DM patients. The present study assessed cardiovascular autonomic functions and sleep duration in T2DM patients.

**Methods:** The study subjects were consecutive patients with T2DM attending autonomic function lab. Based on the sleep duration, subjects were categorised into two groups, subjects having sleep duration of  $\leq 7$  and  $> 7$  h.

**Results:** There was a significant difference in the sleep duration ( $p < 0.0001$ ) and wakeup time ( $p = 0.003$ ) between the two groups. There was no significant difference in the Time Domain, Frequency Domain and Nonlinear measures of HRV.

**Conclusion:** The result of the present study shows that there is no statistically significant change in the autonomic tone compared between the two groups with sleep of  $\leq 7$  and  $> 7$  h, but there was a trend of increased autonomic tone in terms of SDNN and RMSSD in the second group denoting that a longer duration of sleep benefits parasympathetic autonomic tone. The authors suggest that a future study with large number of samples will be beneficial in outlining the true relationship between sleep duration and autonomic functions.

**Keywords:** Autonomic functions, Heart rate variability, T2DM

## POSTER 35

### Proton Pump Inhibition in the Locus Coeruleus Suppresses Neuronal Activity and Augments REM Sleep

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Alteration of bodily CO<sub>2</sub> concentration and proton pump activity affect sleep architecture. The brainstem locus coeruleus (LC) area plays an important role in Rapid Eye Movement (REM) sleep and chemo-regulation. However, it is not known if the LC's chemosensory machinery also modulates REM sleep.

**Objectives:** We studied the role of proton pumps in the LC in the modulation of neuronal activity and REM sleep.

**Methods:** Rats (approved by IAEC, JNU) were surgically prepared for chronic polysomnographic recordings and microinjection of proton pump inhibitor "lansoprazole" in the LC. The low (2 mM) and high doses (10 mM) of lansoprazole and vehicle were injected in the LC. Sleep-wake was recorded before and after injections in the same animal. The localization of proton pumps and cFos expressions after lansoprazole injection in the LC were observed immuno-histochemically.

**Results:** The high and low doses of lansoprazole significantly increased REM sleep by 60% ( $p < 0.001$ ) and 32% ( $p < 0.001$ ), respectively (compared to vehicle). Additionally, we found H/K-ATPase positive neurons in the LC. Interestingly, lansoprazole reduced the number of cFos positive neurons by 52.6% ( $p < 0.01$ ) (compared to vehicle) in the LC.

**Conclusion:** Our results suggest that the LC's proton pumps may be involved in the modulation of both, REM sleep and chemosensory machinery. It further suggests that REM sleep acts as a sentinel to help maintain normal CO<sub>2</sub> level during sleep.

Funding from DBT, DST is acknowledged.

## POSTER 36

### Association of Sleep, Visceral fat and Blood Pressure in Young Adolescents of Gujarati Ethnicity

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**Objective:** To find out the association between sleep, visceral fat, blood pressure in young adolescents of Gujarati ethnicity.

**Methods:** Young healthy adolescents of Gujarati ethnicity were enrolled in the study and divided as per the areas of Gujarat. Their blood pressure was measured using omron sphygmomanometer after adequate rest and taking the adequate precautions. The visceral fat was measured using the body composition monitor omron. Sleep was measured by asking them the no. of hours they sleep in 24 h. We did univariate analysis for finding the correlation between the visceral fat and sleep, diastolic pressure, systolic pressure.

**Results:** There was a negative correlation seen with Visceral fat ( $-0.038$ ), Systolic pressure ( $-0.044$ ) and Diastolic pressure ( $-0.075$ ) with sleep seen in only female population although the results were not significant. We found the sleep in hours in our population to be a higher mean of 7.3 h in males while it was found to be 7.1 h in females. The range of sleep was 6–9 h as the 5th and 95th percentile and 7 h as the 50th percentile in both males and females.

**Conclusion:** The sleep is associated negatively with visceral fat, and blood pressure in female population. Hence adequacy of sleep for more than 7.5 h is prescribed for everybody and especially the females.

## POSTER 37

### Effect of Sleep Deprivation on Hypothalamic, Body and Muscle Temperatures

Binney Sharma<sup>1,2,3</sup>, Lal Chandra Vishwakarma<sup>2,3</sup>, Arani Das<sup>2,3</sup>, Nasreen Akhtar<sup>2,3</sup>, Tapas Chandra Nag<sup>2,3</sup>, Hrudananda Mallick<sup>2,3</sup>

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**Objective:** To study the effect of sleep deprivation on hypothalamic (Thy), body (Tb) and muscle temperatures (Tm) in rats.

**Materials and Methods:** The present study was done as per the guidelines of the institutional ethics committee, AIIMS and Committee for the purpose of control and supervision of experiments on animals (CPCSEA). Six male Wistar rats were implanted with K-type thermocouple near the hypothalamus and dorsal nuchal muscle to record Thy and Tm through a Fluke thermometers. Tb was measured by a pre-implanted peritoneal radio transmitter (TA10TAF-40, DSI USA). Sleep

was recorded by pre-implanted EEG, EOG, EMG and a digital data acquisition system. Sleep deprivation for 24 h was done by gentle handling method. Sleep stages were visually scored for 15-s epochs and correlated with corresponding hypothalamic and body temperatures. The temperatures were averaged over 2 h bins for the corresponding wake, slow wave sleep (SWS) and rapid eye movement (REM) sleep periods. **Results:** Thy, Tb and Tm were raised significantly during 24 h sleep deprivation at night (p value; Thy = 0.001, Tb = 0.0007, Tm = 0.002). But only Thy and Tb were raised significantly during day in 24 h sleep deprivation (p value; Thy = 0.003, Tb = 0.0006). Tb and Thy temperatures show circadian variations. **Conclusion:** Thermoregulatory function of hypothalamus was affected by sleep deprivation Thy and Tb were greater during sleep deprivation during both light - dark cycle.

## POSTER 38

### Correlation of Chronotype with Sleep Quality, Demographic and Life Style Factors in Asymptomatic Healthy Adolescents

Anil Kumar Gangwar<sup>1</sup>, Anita Rawat<sup>2</sup>, Sunita Tiwari<sup>3</sup>, Ravindra Garg<sup>4</sup>, Surya, Kant<sup>5</sup>

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**Objectives:** To see the association of demographic and lifestyle factors with poor sleep quality.

**Methods:** In this cross sectional study a total of 203 subjects were enrolled after taking ethical clearance. All subjects were divided into three groups, group I (n = 73), group II (n = 87) and group III (n = 43) on the basis of morningness-eveningness score. Type of electronic media used and duration of media use were assessed on subjective basis. Type of food and timing of dinner were assessed subjectively. Level of physical activity, sleep quality, daytime sleepiness and chronotype were assessed by International physical activity questionnaire (IPAQ), Pittsburgh sleep quality index (PSQI), Epworth sleepiness score (ESS) and Morningness-Eveningness questionnaire self-assessment version (MEQ-SA) respectively.

**Results:** Statistically significant difference was found in BMI, sleep quality, sleep duration, electronic media use at bedtime and timing of dinner among study groups. On comparing the groups we saw that subjects of group I were suffering more with poor sleep quality.

**Conclusions:** The chronotype demonstrated significant association with the quality of sleep, in such a way that evening-type individuals showed poor quality of sleep in comparison to the morning- type ones as well as indifferent ones.

**Acknowledgement:** Author acknowledges the Indian Council of Medical Research (ICMR) for funding the research work

## POSTER 39

### Effect of REM Sleep Deprivation on Hypothalamic and Cortical Temperature in Rats

Lal Chandra Vishwakarma<sup>1</sup>, Binney Sharma<sup>2</sup>, Arani Das<sup>2</sup>, Ashok Jaryal<sup>2</sup>, Hrudananda Mallick<sup>2</sup>

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**Objective:** To study the effect of REM sleeps deprivation on hypothalamic and cortical temperature in rats

**Materials and Methods:** The present study was done as per the guidelines of the Institutional ethics committee, AIIMS and for the purpose of control and supervision of experiments on animal (CPCSEA). Six adult male Wistar rats were chronically implanted with electrodes for recording EEG, EOG and EMG. Thy and TCort were measured by pre-implanted thermocouples near the hypothalamus and the cortex respectively connected to separate Fluke multimeter. Flower pot method was used for 12 h REM sleep deprivation in rats. Thy and TCort were recorded simultaneously during sleep-wakefulness and REM sleep deprivation. Sleep stages were scored with Sleep Sign software, then visually corrected for 15-s epochs and correlated with corresponding temperatures. The temperatures were averaged hourly for the wake, quiet wake, light slow wave sleep, deep slow wave sleep and REM sleep

**Result:** Cortical temperature lower than hypothalamic temperature in time matched control recording. The hypothalamic temperature showed statistically significantly increase compared to control in initial 2 h of REM sleep deprivation, followed by a constant decrease. Cortical temperature showed significant decrease throughout the REM sleep deprivation.

**Conclusion:** Hypothalamic temperature increase throughout REM sleep deprivation than cortical temperature.

## POSTER 40

### Assessment of Sleep Pattern and Habits in Young Adults in Delhi-National Capital Region

Dr. Nandita Narayanasamy<sup>1,2</sup>, Charvy Rana<sup>2</sup>, Eeshita Das<sup>2</sup>, Lovika Rajpal<sup>3</sup>, Mohd Areeb<sup>2</sup>, Nishtha Mahendru<sup>4</sup>, Sakshi Ghosh<sup>4</sup>, Sakshi Jindal<sup>2</sup>, Vanshika<sup>2</sup>

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**Objective:** The aim of this investigation was to analyse the variance in the sleep pattern of young adults and determine associations between sleep duration and deprivation with daytime sleepiness.

**Methodology:** A cross-sectional questionnaire based study was conducted on college students in Delhi-National Capital Region. The answers were scored according to the International Classification of Sleep Disorders norms. The parameters evaluated were total sleep hours, time of going to bed, daytime sleepiness and use of stimulants to modulate sleep.

**Results:** 300 students with a mean age  $20.05 \pm 1.4$  were screened among whom 60% were female and 40% were male. The average number of hours of sleep was found to be  $7.2 \pm 1.3$ , and only 18% of respondents surveyed slept for 8 h and above while 23% slept for less than 6 h in a 24 h cycle. About 60% went to bed after 12:00a.m., only 33.5% felt refreshed on waking while 51.6% felt sleepy and tired during the day. Chi-square results at 95% confidence level showed dependence between the use of stimulants and the incidence of daytime sleepiness as well as the hours of sleep and daytime sleepiness.

**Conclusion:** We conclude that difficulty in falling asleep, delayed sleep time, sleep deprivation and daytime sleepiness may be seen in young adults.

**Keywords:** Sleep deprivation, Daytime sleepiness, Delayed sleep time, Urban youth

**Acknowledgement:** Sri Venkateswara College funded by University of Delhi Cluster Innovation Centre-Star Innovation Project.

## POSTER 41

### Case of Secondary Infertility in Male Associated with Obstructive Sleep Apnea

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**Background:** OSA is associated with a lot of comorbidities, but association with infertility has not been described in literature.

**Case:** A 35 year male non-diabetic non-hypertensive, was being evaluated for secondary infertility in endocrinology department. Patient's wife workup was absolutely normal. His prolactin level was 18.2 ng/ml which was normal for his age and sex. However patient's sperm count was 10 million per ml. Patient's BMI was  $29.5 \text{ kg/m}^2$  and his rest of the general examination was normal. Patient's wife reported that patient was a loud snorer and there was also history of mild excessive daytime somnolence with Epworth Sleepiness Score of 11. Patient's polysomnography revealed apnea hypopnea index of 31.5. Patient was advised CPAP therapy and other lifestyle modification measures. Six months later patients repeat sperm count was 50 million per ml. Patient's wife was able to conceive later.

**Discussion:** Infertility in OSA has been associated with increased prolactin levels<sup>1</sup>, however association with decreased sperm count is being described for the first time.

**Conclusion:** OSA may be associated with infertility and treatment by CPAP may help in restoring fertility

**Conflict of interest:** None.

## POSTER 43

### Intracerebral Microinjection of Endocannabinoid Dose Standardization for Effects on Sleep Wakefulness

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**Objective:** To study the effect of intracerebral injection of (CB1) agonist, (CB1) antagonist on sleep-wakefulness at the medial septum in rats.

**Materials and Methods:** Six male Wister rats (weight between 200 and 250gm) were chronically implanted with EOG, EEG, EMG electrodes for recording sleep. A unilateral guide cannula was implanted 2 mm above the medial septum for microinjection of endocannabinoid (CB1) agonist, antagonist (0.3, 0.5, 0.7  $\mu\text{g}/200 \text{ nl}$  dissolve in DMSO). After post-operative recovery, three baseline recordings of sleep wake were taken for 6 h on three alternate days. This served as a time matched control. On the day of microinjection, 2 h of baseline recording were taken followed by microinjection at 12:00 h using an injector cannula and recording was continued for next 4 h. From the polysomnogram, the % value of total sleep time, wake time, slow wave sleep time and total paradoxical sleep time were calculated for each hr using Sleep Sign software. Time matched comparison was made with the average of three baseline recordings and the values of pre injection 2 h recording and post injection 4 h recording the effects in sleep wakefulness cycle compared.

**Result:** CB1 agonist increases paradoxical sleep at higher dose (0.7  $\mu\text{g}/200 \text{ nl}$ ) and CB1 antagonist decreases paradoxical sleep and slow wave sleep at higher dose (0.7  $\mu\text{g}/200 \text{ nl}$ ).

**Conclusion:** The preliminary results suggest that endocannabinoid at the medial septum promote paradoxical sleep.

## POSTER 44

### Analgesic Modulation of Tramadol in Obese Wistar Rats

Shakta Mani Satyam<sup>1</sup>, Laxminarayana Kurady Bairy<sup>3</sup>, Vasudha Devi<sup>1</sup>, Syed Musharaf<sup>1</sup>, Jay Prakash<sup>2</sup>

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**Objective:** To investigate the effect of tramadol on pain threshold among adult obese male and female Wistar rats.

**Methods:** This study was carried out after the approval (IAEC/KMC/41/2014) from IAEC, KMC, Manipal. A total of 48 adult Wistar rats (body weight  $\leq 150$  g), 24 each male and female Wistar rats were fed orally Vanaspati daalda + Coconut oil (3:1)-10 ml/kg/day for 90 days. Thereafter, all of them (body weight  $\geq 300$  g), 24 each male and female Wistar rats were randomly divided into two groups ( $n = 6$ /group) for each nociception model- plantar test and acetic acid induced writhing test as: Group I-0.9% saline control; 1 ml/kg/day i.p. and Group II-Tramadol 10 mg/kg/day i.p. The treatment duration was of five days. On 6th day, paw withdrawal latency was assessed using plantar test and writhing movements were observed following administration of 0.8% acetic acid; 10 ml/kg i.p.

**Results:** The paw withdrawal latency was significantly decreased ( $p < 0.001$ ) and number of writhing movements were significantly increased ( $p < 0.001$ ) in female control group compared to male control group. In tramadol treated female rats, paw withdrawal latency was significantly decreased ( $p < 0.001$ ) and number of writhing movements were significantly increased ( $p < 0.001$ ) in comparison with the tramadol treated male rats.

**Conclusion:** Obese female rats have lower pain threshold than obese male rats and also the analgesic effect of tramadol is more pronounced in obese male rats compared to that of obese female rats.

## POSTER 45

### Ambient Temperature Induces Change in REM Sleep in Rats

Arani Das<sup>1,2,3</sup>, Deependra Kumar<sup>1,2,3</sup>, Velayudhan Mohan Kumar<sup>1,2,3</sup>, Hrudha Nanda Mallick<sup>1,2,3</sup>

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**Objective:** To study the propensities of REM sleep in different ambient temperature in rats.

**Methods:** The data of 10 male Wistar rats, which are available, were reanalysed to evaluate the propensity of REM sleep within the range of thermonutral zone (24, 27, and 30 °C). The methods employed in this study are briefly described below. These rats were chronically implanted with electrodes for recording EEG, EMG and EOG. The preferred ambient temperature (Tamb) was assessed by allowing them to stay (6 h) in 27, 30 and 33 °C. Sleep wakefulness was recorded for first 2 h at preferred ambient temperature and subsequent 6 h with Tamb maintained at 18, 21, 24, 27, 30, 33 and 36 °C, with a gap of 24 h between exposures of each ambient temperature.

**Results:** Rats preferred to stay at 27 °C but maximum sleep was recorded at 30 °C. Ambient temperature related changes in the REM sleep and deep slow wave sleep showed a bell shaped curve with a maximum REM sleep at 30 °C. REM sleep showed more marked ambient temperature related changes than deep slow wave sleep. Ambient temperature above 33 °C and below 24 °C produced significant reduction of sleep.

**Conclusion:** REM sleep showed more marked changes even to a slight variation in Tamb. It was maximum at 30 °C ambient temperature. Higher end of thermonutral zone may be employed to produce maximum REM sleep. This requires conformation from human studies.

## POSTER 46

### Differential Effects of Transcranial Alternating Current Stimulation on NREM and REM Sleep in Healthy Adults

Rahul Venugopal<sup>1</sup>; Arun Sasidharan<sup>2</sup>, Vrinda Marigowda<sup>2</sup>, Ajay Kumar Nair<sup>1</sup>, Gulshan Kumar<sup>1</sup>, Tejas SJ<sup>2</sup>, Chetan Mukundan<sup>2</sup>, Sumit Sharma<sup>2</sup>, Bindu M Kutty<sup>1</sup>

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**Background:** Transcranial alternating current stimulation (tACS) is increasingly a method of choice in a wide variety of clinical settings (depression, attention deficit hyperactivity disorder, schizophrenia etc.) as well as for cognitive enhancements. However the effect of tACS on sleep has not been well explored.

**Objective:** To understand the effect of tACS manipulation on Rapid Eye Movement (REM) and Non Rapid Eye Movement (NREM) sleep in healthy adults.

**Methods:** Whole night polysomnography recordings were carried out on healthy controls ( $n = 10$ ) using 24 scalp electrodes on three consecutive nights (baseline followed by a random order of tACS during REM or NREM). The tACS pulse train was applied bilaterally (fronto-temporal configuration) with 0.75 Hz during NREM and 40 Hz during REM sleep. Four recording electrodes were used to provide the tACS stimulation. Data from before and after the tACS application were analysed. Power spectral measures as well as macro and micro sleep architecture variables were evaluated.

**Results:** Preliminary results indicate differential effects of tACS on REM and NREM sleep. Details will be presented during the conference.

**Conclusions:** Interventions using tACS provide different effects during REM and NREM sleep electrophysiology. Understanding the characteristic effects of these oscillatory entrainments will provide avenues for targeting novel minimally invasive therapeutic modalities for a variety of disorders that have concomitant sleep pathology.

## POSTER 47

### A comparative study of Screen time, sleep duration and behavioural disturbances in urban and rural High school children

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**Background:** Sleep problems are a common yet unrecognised problem in adolescents. Environmental factors can negatively influence sleep quality and one such factor is the use of light emitting electronic devices. With the advent of multiple screen based devices there has been a decline in the sleep quantity and quality among adolescents. This is a matter of concern as increased screen viewing duration is

associated with poor sleep quality, this in turn can have an adverse impact on behaviour of the children

**Aims:** To study use and impact of electronic devices such as television, mobile phones, personal computers and tablet devices on sleep & behaviour in school children

**Methods:** 120 high school students (8th–10th std) took part in the study. 60 each from an urban and rural school in Mysore district in Karnataka. The Pittsburgh sleep quality index was used to assess the overall sleep quality in the last 1 month along with the Epworth Sleepiness scale to quantify the daytime drowsiness. Behavioural disturbances of the children were assessed with the Aberrant behaviour checklist. A specific questionnaire was developed to assess demographics, medical information, Screen viewing duration and patterns on weekdays as well as weekends and finally the content of device use was also studied. Students with a history of substance use, a diagnosed sleep disorder and any psychiatric disorder diagnosable as per ICD 10 were excluded from the study

**Results:** Will be discussed at the time of presentation

## POSTER 49

### Fear Memory Consolidation During Sleep after Early Maternal Separation Stress

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**Objectives:** To understand the processes involved during the fear memory consolidation, the present study has investigated the neural activities in the fear circuit immediately after classical fear conditioning.

**Methods:** Rat pups were subjected to maternal separation and isolation (MS) stress during postnatal days P4–P14 (6 h daily). Polysomnographic recordings and differential fear conditioning was carried out in male Wistar rats from Control (NMS) and MS rats (2–3 month age). The electrodes were implanted in the CA1, Lateral nucleus of amygdala (LA) and Infra Limbic Cortex (ILC), with EOG and EMG. The neural correlates of REM sleep after fear conditioning was calculated using coherence, FFT and correlation analysis.

**Results:** Results indicated that MS stress during SHRP has affected not only sleep architecture, but also affected the consolidation of fear memory during sleep. Second, strong correlation between fear memory consolidation and network activity in the amygdala-hippocampal-cortical circuit during REM sleep was observed.

**Conclusion:** The hypothesis was that MS stress during SHRP may alter the corticosterone level even at adulthood. This may determine the functional status of fear (amygdala-hippocampal-cortical) circuit following fear conditioning which was detected during REM sleep. Thus, these results provide evidence that long term memory formation takes place during REM sleep which gets affected in the animals having early life stress.

## POSTER 50

### Subfoveal Choroidal Thickness Changes Among Obstructive Sleep Apnea Subjects: a Meta-Analysis

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**Objectives:** The Choroid is highly vascularized tissue in the body. Obstructive sleep apnea (OSA) is associated with significant vascular changes. Several studies have reported the association between Choroid thickness and severity of OSA with incompatible results. Therefore, Our objective was to evaluate the association of Subfoveal Choroidal thickness (SFCT) measured by Optical coherence tomography (OCT) with the severity of OSA by performing Meta-analysis. **Methods:** Literature review conducted by searching Scopus, Web of Science, Embase, and PubMed databases to find relevant published data until June 2017. Reference list of retrieved articles also reviewed. Summary of mean difference (MD) with 95% Confidence Intervals (CI) was computed by using random effects model.

**Results:** Eight case–control studies involving 1006 eyes (673 in OSA and 333 in control groups) were included in the meta-analysis. Results showed significant reduced SFCT in OSA group. The MD of SFCT was  $-13.11 \mu\text{m}$  (95 CI  $-65.90$  to  $39.67$ ) for overall combined OSA group,  $-7.34 \mu\text{m}$  (95 CI  $-15.15$  to  $0.46$ ) for mild OSA,  $-27.37 \mu\text{m}$  (95 CI  $-52.07$  to  $-2.67$ ) for Moderate OSA and  $-43.64 \mu\text{m}$  (95 CI  $-89.38$  to  $2.09$ ) for severe OSA group when compared with controls.

**Conclusion:** This meta-analysis shows the evidence that SFCT is associated with OSA. It was also observed that SFCT inversely proportional to the severity of the disease. Therefore, we can use reduced Choroid thickness as one of the ocular manifestation of OSA.

## POSTER 51

### Population at Risk of OSA- A Study on People Attending Health Care Facilities in Chittagong

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Obstructive Sleep Apnea (OSA), like worldwide, is an under-recognized and underdiagnosed medical condition in Bangladesh with lack of sleep lab and expertise.

In this study we tried to find out risk of OSA among our people using STOP-BANG questionnaire where a total of 270 people aged 20–75 were interviewed with consent who were attending outdoors of three medical college hospitals and scoring was done and categorized in low, medium and high OSA risk according to risk score.

OSA risk was found high in 24.8% people with moderate risk in 34.8%. Risk was highest with BMI >35 (95%) and snoring (94%). Neck circumference >40 cm was also found to have similar high risk value (84%).

**Acknowledgement:** University Health Science, Canada and Medical Research Foundation Chittagong.

## POSTER 52

### A Follow up Study to Assess Effectiveness of Behavioral Therapy in Treatment of Obstructive Sleep Apnea

Abhishek Dubey<sup>1</sup>, Surya Kant<sup>2,3</sup>, Balendra Pratap Singh<sup>2</sup>, Darshan K Bajaj<sup>2,3</sup>, Swati Dixit<sup>3</sup>

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**Objectives:** To assess effectiveness of behavioural therapy in treatment of obstructive sleep apnea

**Methods:** In this hospital based follow-up study, weight loss, anthropometric measurements, maintenance of physical activity and Epworth sleepiness score was measured at baseline and after one year of the initiation of the behavioural therapy in 33 diagnosed OSA male subjects of age between 30 and 50 years with Apnea–hypopnea index (AHI) of at least 15 events/hr based on overnight polysomnography. SPSS was used for statistical analysis.

**Results:** After one year 23 subjects were available for follow up as one subject was migrated outside the city, 9 subjects were either not willing to participate in follow up assessments or not had time to participate in follow up assessments. Weight loss was achieved in only 34.7% (n = 8) subjects, maintenance of basic level of physical activity was present in only 39.1% (n = 9) subjects and reduction in Epworth sleepiness score was detected in 52.1% (n = 12) subjects

**Conclusions:** Behavioural therapy is a low cost alternative of various NONCPAP and CPAP therapy in treatment of OSA but slight or

adequate effectiveness of this mode of treatment may only be seen in approximately one-third of the population after 1 year long follow up.

## POSTER 53

### Design Issues of an Intelligent System for Obstructive Sleep Apnea Detection, as an Aid for Experts at Primary Health Care Facilities

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**Objectives:** 1. To design an optimized algorithm for detection of OSA in a non-invasive, at an earlier stage, that will be tested using the ECG signal characteristics from the records of standard ECG-apnea database from Physionet.org, MIT website; 2. To propose an optimized set of physiological parameters that can be used as complementary to the larger set of parameters used in Polysomnography (PSG) test.

**Methods:** Steps used for OSA detection by analyzing ECG and EDR signal characteristics in LabVIEW; Read from standard ECG-apnea database, the ECG signal recorded during night time and then for elimination of noise through pre processing; Estimation of the performance of the algorithms in terms of Accuracy, Specificity and Sensitivity.

**Results:** Here the OSA detection results are presented in terms of accuracy, specificity and sensitivity. We also estimated the power and energy profile along with battery life.

**Conclusion:** Wavelet transform based approach of preprocessing and QRS detection has proven to yield better results as compared with other algorithm. As a future scope, we want to estimate the severity of OSA, as mild, moderate and severe based on its Apnea-Hypopnea index and thus propose a minimized set of parameters as compared against PSG.

**Acknowledgement:** Management of SDM College of Medical Sciences (SDMCMS), Dharwad for having assured to provide the Ethical clearance for carrying out my work with real time recordings of patients from their sleep Lab.

**POSTER 54****Altered Sleep Pattern and its Neural Correlates in Prenatal Valproic Acid Exposed Rat**

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Prenatal exposure to teratogens such as Thalidomide, Valproic acid are known to cause various neurodevelopmental disorders such as Autism spectrum disorder, Attention Deficit Hyperactivity Disorder (ADHD), etc. The prevalence of neurodevelopmental disorders has been increasing over the last two decades. Autism Spectrum Disorder (ASD) which has a current global prevalence of 1.2%, 40 to 80% of children with ASD have sleep disturbances, but the neurobiology of sleep disturbances in ASD and its neural network is poorly understood.

The aim of the present study was to unravel the neurobiology behind the sleep abnormality in ASD using rodent model.

We used the Sprague–Dawley rats and prenatally exposed them to sodium valproate on embryonic day 12.5. To validate the model we assessed their social interaction, repetitive behaviour sensory motor integrity and anxiety levels which are affected in ASD. These parameters were measured using three chamber social interaction test, marble burying test, startle response test and light–dark test, during two different time period (early adolescent and adulthood). Then polysomnography recordings were carried out.

Rats exposed to VPA prenatally showed repetitive behaviour, increased amplitude of startle response and decreased prepulse inhibition (especially at 85db/30 ms interval), decreased anxiety and increased exploratory behaviour when compared to normal control rats. Further details will be discussed during poster presentation.

**POSTER 55****Enriched Environment Modulates Altered Sleep Architecture in Temporal Lobe Epilepsy**

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Temporal lobe epilepsy (TLE) is associated with various comorbid conditions which affects sleep architecture, which in turn might precipitate seizures especially during non-rapid eye movement (NREM) sleep. In addition, impaired sleep is associated with increased suicide attempts. Our earlier report showed that exposure to Enriched Environment (EE) decreased seizure frequency and duration and ameliorated epilepsy induced depression and cognitive impairments.

The aim of this study is to understand the relationship between sleep and epilepsy and the influence of EE on the sleep architecture in rats with lithium pilocarpine induced chronic TLE. All experimental procedures were approved by Institutional Animal ethics committee. 30 days after Status Epilepticus (SE), rats were implanted with electrodes. Following 10 days post-surgical recovery, rats were subjected to 6 h of EE for 14 days following which electrode placement was verified.

Our preliminary results show a decreased REM sleep in epileptic rats. Interestingly, epileptic animals subjected to EE could

significantly restore the altered sleep architecture. Understanding the relationship between the EE and sleep in epileptic rats may help us to develop adjuvant non-pharmacological treatment strategies to counter epilepsy-induced changes in sleep architecture and cognitive deficits.

**Keywords:** Temporal lobe epilepsy, enriched environment, REM Sleep

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**POSTER 56****Induction and Evaluation of Lucid Dreaming: an Approach to Study Consciousness During Sleep**

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**Objectives:** Induction of lucid dreaming in normal healthy controls using cognitive techniques along with acoustic stimuli and evaluation of subjective reports of lucid dreaming correlating with Electroencephalography (EEG) spectra during the peri-stimulus periods.

**Methodology:** The study included healthy male subjects with age range of 25–35 years (n = 11). Subjects were divided into two groups: Lucid Dreaming with Acoustic Stimulus (LDA) and Controls (CNT). Polysomnography (PSG) recordings were done on both the groups with 3 months of interval. In the present study we applied three techniques namely: reflection, intention and autosuggestion to LDA only. Acoustic stimuli were given to both lucid dreaming and control groups at the time of PSG assessment after 3 months. Protocol was approved by Institute Human Ethics Committee: No. NIMH/DO/ETHICS SUB-COMMITTEE 11TH MEETING/2015/Item No. II, SI. No. 2.01 (Basic Sciences).

**Results:** The study could induce lucid dreaming experience in 80% of the participants from LDA group and 20% of participants from CNT. An increase in gamma, alpha and beta power in frontal, temporal and parietal region is observed along with subjective reports of control over dreams.

**Conclusion:** Increase in gamma activity in frontal region seems to be related with attention and abstract thinking whereas activation of parietal region is considered to be related with self-awareness and semantic understanding.

**Acknowledgement:** Funded by NIMHANS.

**POSTER 57****Assessment of Sleep–Wake Behavior in Neonatal Ventral Hippocampal Lesion Model of Schizophrenia**

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**Objectives:** Sleep disturbances reported in schizophrenia (SZ) are increased sleep-onset latency, decreased total sleep time and slow wave sleep, shortened rapid eye movement (REM) latency and duration. In neonatal ventral hippocampal lesion (NVHL) rat model of SZ, many behavioral, physiological, and molecular changes

reminiscent of a variety of aspects of SZ emerge at early adulthood/adolescence. Thus, sleep–wake behavior is assessed in NVHL model, that could be used to understand the changes in neural circuitry involved in sleep disturbance in this disorder.

**Methods:** Rat pups were subjected to bilateral ventral hippocampus (VH) lesion on postnatal day 7 by infusing ibotenic acid (NVHL group) or phosphate buffer saline (VC). At around 2 months, animals were subjected to open field test (OFT), followed by surgery for assessing sleep–wake behavior. Following recovery from surgery, 6 h of polysomnographic recordings of both groups was acquired and

sleep stages [total wake and sleep time (TWT and TST), non-rapid eye movement sleep (NREM) and REM] were scored using Brain Electro Scan System (Axxonet, Bangalore).

**Results:** Locomotion hyperactivity was observed in NVHL group, which also showed increased TWT, decreased NREM, REM stages and TST when compared to VC group.

**Conclusions:** Sleep disturbances observed in NVHL model could be due to thalamocortical network dysfunction and changes occurring at the level of various neurotransmitter systems due to neonatal lesioning of VH.