

Pediatric Sleep Project

T U S U K U M A R A N

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It is my pleasure and privilege to present one of my novel project for this IAP year – The Pediatric Sleep Project. Sleep is a physiological state of unconsciousness from which a person can be aroused fully, compared to coma where arousal is either not there or is partial. Sleep is now considered to be an active process by the inhibition of the arousal system. In children especially growth hormone production is augmented during sleep. Increased production and decreased catabolism of protein occurs during sleep. Sleep disorders can lead to neurocognitive impairment, behavioral disorders like attention deficit and substance abuse in addition to the burden on the care givers.

STAGES OF SLEEP

Sleep is divided into non rapid eye movement sleep(NREM) and rapid eye movement sleep (REM). Wakefulness is characterized by alpha rhythm (8-13 Hz). NREM is divided into 3 stages. N1 (stage 1, light sleep) is low voltage 4-8 Hz (theta) and constitute only 2-5% of sleep cycle. N2 (stage 2) is 10-25 minutes duration and occupies 45-55% of the sleep time. N3 is stage 3 and 4 (deep sleep)occupies 15-20% of sleep time. This is characterized by high frequency low voltage theta waves (2 Hz). REM is divided into tonic and phasic cycles. Tonic REM is characterized by high arousal threshold and penile erection in men. In REM there is rise in heart rate, BP, dreaming, paralysis of the muscles and increase in the brain metabolism. The usual progression of sleep in first cycle is from N1 to N3 to REM and usually complete in 70 to 100 minutes (mean 90 minutes) compared to 90-120 minutes of subsequent cycles. In the first one third of the sleep cycle N3 is usually seen while in the rest of the sleep REM is predominant.

PHYSIOLOGY OF SLEEP

Sleep center is situated at ventrolateral preoptic nucleus. GABA and galanin initiate sleep by inhibiting arousal neurons. Arousal centers are tuberomammillary nucleus, lateral hypothalamus, locus coeruleus, dorsal raphe, laterodorsal tegmental (LDT) nucleus, and pedunculopontine tegmental (PPT) nucleus. The excitatory neurotransmitters from this centers are orexin, histamine and acetylcholine. Adenosine is the hormone that help transmission to sleep state. Initial NREM sleep is due to the inhibition by GABA on excitatory centers. Later the cholinergic REM is due to the activation of PPT, LDT and basal forebrain. REM has parasympathetically mediated tonic component and sympathetically mediated phasic component. Pupillary dilatation, increased heart rate, respiratory rate are due to this phasic component. Muscle atonia and rapid eye movements are important features of REM sleep.

SLEEP WAKE CYCLES

This is dependent on intrinsic circadian pacemaker, a homeostatic process. Sleep drive is dependent on the duration of wakefulness. As duration of wakefulness increase the homeostatic process also increase till sleep is established. The circadian process act independently of wakefulness, sometimes a dip in the circadian process occurs in the afternoon and is the reason for the afternoon lunch dip.

DURATION OF SLEEP

Exact Indian data is not available regarding the duration of sleep in Indian children. Various studies show that our children sleep less than their counterparts in developed nations by 2-3 hours.

Newborns sleep for 14-16 hours a day. This gradually decreases around 4-5 months. Subsequently they become nocturnal sleepers. Initially sleep cycle routine like night or day is not seen in new born. On an average they used to wake up 3-4 times during night. By 3 months most of the newborns night sleep increase in duration. This is important in mothers point of view as they need to be fed by 2-3 hrs only. Inadequate sleep decrease prolactin secretion in mother, which is important in breast milk production. Newborn sleep is REM sleep, at the expense of NREM especially N3 sleep. As the infant becomes older slow wave sleep evolves.

Infants sleep for 12 to 14 hours. Preschool children may have day time nap and they avoid that when they reach the school. Children aged 6-12 years requires 10-11 hours of sleep in a 24- hour period while adolescents generally require about 9-9.30 hours of sleep per night and adults on an average about 7-8 hours of sleep per day.

SLEEP DISORDERS

Dyssomnias are the disorders that produce either difficulty initiating or maintaining sleep or excessive sleepiness. These can be intrinsic or extrinsic.

Parasomnias are manifestations of central nervous system activation through the skeletal muscle; and include arousal disorders, sleep-wake transition disorders; those usually associated with REM sleep; and others.

Sleep disorders can also be associated with mental, neurologic, or other medical disorders.

Proposed sleep disorders Obstructive sleep apnea syndrome (OSAS), restless leg syndrome, sleep walking, sleep paralysis, sleep terror, narcolepsy, sleep talking.

CO-SLEEPING

Keeping the child in close proximity to the parents is known as co-sleeping. Bed sharing is one in which children sleep in the same bed as that of the parents and co-bedding is one in which the children share the same bed of sibs. There are advantages as well as disadvantages in co-sleeping. Indian cultures favor co sleeping. There is more chance for bonding,

SLEEP RITUALS

1. Start the rituals before you plan sleep, that has a relaxing experience like a warm bath, reading, drinking a glass of milk, brushing or flossing your teeth.
2. Go to bed only when you are really sleepy. In practical terms most of the children, men and women have a set time and it is better to adhere to this set time.
3. It is important to make it a practice to wake up at the same time always either by an alarm or entrusting somebody for the same.
4. Avoiding naps after 3 pm is good to have a proper sleep at night.
5. If not able to fall into sleep by 20 minutes it is better to move out of bed and to do some kind of relaxing things.
6. Avoid alcohol, nicotine, heavy dinner, all kind of caffeinated items, severe exercises at least 6 hrs before bed time.
7. Always try to get a full night sleep.
8. Don't use the bed for planning next day's activities.
9. Don't go to bed if you are hungry.
10. Avoid sleeping pill.

breastfeeding and prevention of SIDS by this method. But if any of the parents are smokers or alcoholics or if the parents has to wake up at night frequently for any reason, co-sleeping is not advisable. It is not a bad idea to encourage children to sleep alone in another room by 3 years without locking up either the children's or the parent's room. All pediatricians have to address the sleep history also in the interview with the parents and adolescents. Practicing sleep rituals, maintaining sleep diary are important steps to have a good sleep hygiene to improve the cognitive ability of our children. Facility for sleep studies has to be given momentum in the coming years.

We had a successful TOT in Mumbai, 3rd September 2011 led by national trainers Dr Rajeshwar Dayal, Dr Yamuna, Dr C Jayakumar. We are planning to conduct twenty five district workshops soon. I thank Dr Rajeshwar Dayal, National Chairperson, Dr H Paramesh, National Co-ordinators, Dr Yamuna and Dr C Jayakumar for preparing the module. I acknowledge the help of Dr C Jayakumar for preparing this article.