

Sleep Related Habits and Problems in a Community of School Children in Delhi

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ABSTRACT

This study aims to highlight the nature of sleep problems secondary to sleep disordered breathing (SDB) in children and bedtime behavioural patterns. This cross sectional study was done in a special cohort of children, under the ESIC (employees state insurance corporation) scheme, aged 5 to 13 years (males:107,females:94) and attending the paediatric outpatient department for various medical problems. The questionnaire used for this study was based on paediatric sleep questionnaire University of Michigan USA. The questionnaires were filled in by caregivers of 201 patients attending the paediatric OPD. The overall prevalence of symptoms suggestive of sleep disordered breathing (SDB) was found in 31.8%(64) patients and that of sleep habits contributing to development of behavioural insomnia in children (BIC), sleep association type and limit setting type was found in 55.2%(111)patients.

Sleep disordered breathing symptoms were positively correlated with medical conditions,. Snoring and snorting were positively correlated with all 3 medical conditions, i.e. tonsillar enlargement, asthma and allergy, while open mouth breathing, complaints of trouble while sleeping was positively correlated with asthma and allergy. Some Sleep disordered breathing symptoms correlated with daytime behaviour problems. Snoring correlated with inattention, snorting with decreased concentration. Open mouth breathing and grinding were correlated with daytime fatigue. Dry mouth, open mouth breathing and grinding were positively correlated with decreased alertness on morning awakening.

Only 3 patients (1.4%) complained of sleep disruption associated with enuresis; however 198(98.5%) patients did not primarily complain of sleep problems associated with any other medical condition.

Key Words: Behavioural Insomnia in Children (BIC), Sleep Disordered Breathing (SDB), Obstructive Sleep Apnoea (OSA)

INTRODUCTION

Sleep duration and quality has a major role to play in effective cognitive emotional and social development in children. Sleep problems are seen in all age groups and developmental life span such as early infancy, late infancy, early childhood, late childhood and adolescence. An overview of normal developmental patterns of sleep, the changes in each stage is

required in order to diagnose sleep associated problems and their implications. Sleep disorders are under diagnosed in paediatric practise. In an Australian population of children aged 4.5 years to 16.5 years; parents addressed sleep problems only in 4.1% of the cases and General Practitioner discussed sleep problems in 7.9 % of cases. ⁽¹⁾ Medical conditions or inappropriate behavioural patterns at

bedtime interfere with sleep organisation and are associated with arousals. Sleep organisation i.e. sleep awake schedules need to be consistent and age appropriate, for example naps are encouraged as they are important for infants and toddlers unlike for older children. Sleep organisation includes earlier bedtimes for younger children as compared to an adolescent for whom a later bedtime is permitted in accordance to the shift of the internal clock. Appropriate sleep conducive environment is required across the developmental spans.

The international classification of sleep disorders classifies sleep disorders into six major categories, 1) insomnia 2) sleep related breathing disorders 3) hypersomnias 4) circadian rhythm sleep disorder 5) parasomnia 6) sleep related movement disorders. ⁽²⁾ Sleep Disordered Breathing (SDB) spectrum, can manifest from partial upper airway obstruction (simple snoring and upper airway resistance (UARS) to complete upper airway obstruction (OSA.). Risk factors for SDB include a craniofacial anomalies, neuromuscular diseases and commonly encountered adenotonsillar hypertrophy. Polysomnography is the gold standard diagnostic tool. ⁽³⁾ Severity of OSA is determined by the apnoea/hypopnoea index (AHI). Apnoea is defined as absence of airflow with continued chest and abdominal wall movements for a duration longer than 2 breaths, whereas obstructive sleep hypopnoea is decreases nasal flow between 30 to 80 % from baseline with corresponding decrease in oxygen saturation by 3% and/or arousal. ⁽⁴⁾ SDB is clinically suspected if the child has the following symptoms in sleep, the child snores, has trouble breathing while sleeping, struggles to breathe, gasps, snorts becomes sweaty, breathes with an open mouth, has a dry mouth on waking up or grinds in sleep.

Behavioural sleep problems includes behavioural insomnia in children, which is characterised by a learned inability to fall asleep and /or stay asleep, It includes bedtime problems such as stalling or resistance to sleep, difficulty in falling

asleep and associated night awakenings. Childs temperament, circadian preferences, medical illness, neurodevelopmental disabilities, psychological issues such as anxiety /depression, ability of caregiver to set limits and other inadequate sleep hygiene practices contribute to BIC.

A consensus definition of paediatric insomnia is repeated difficulty in sleep initiation, duration & consolidation or quality that occur despite age appropriate time opportunity to sleep which resulted in some daytime impairment for child and family was proposed by Mindell et al. ⁽⁵⁾

ICSD -2 defined 3 subtypes of behavioural insomnia in children based on aetiology of bedtime problems and night awakening. Sleep onset type BIC which is, commonly seen between 6 months to 3 years, resulting from inappropriate associations such as rocking movements, watching television or requiring presence of parent. Limit setting BIC which is commonly seen in toddlers, preschoolers and school children, resulting from inadequate or inconsistent limit setting practices by parents, resulting in delaying or avoiding bedtime by strategies such as asking for use of bathroom or another story etc. Combined type of BIC including both patterns. ⁽⁶⁾

2014 revision ICSD -3 no longer separates insomnia into diagnostic categories but includes terms such as chronic insomnia, short term insomnia and other insomnia disorders. ⁽⁷⁾ The aim of this study was to evaluate the sleep problems due to SDB and bedtime behavioural patterns that may contribute to the development of BIC, their associations and implications.

METHODOLOGY

The parents of 201 paediatric patients aged 6 to 13, who attended the paediatric outpatient clinic for various medical problems, duly consented to fill up the questionnaire in collaboration with their child if he/she cooperated. This questionnaire was explained to the parent in

detail and their queries if any, were answered. This questionnaire is based on the sleep questionnaire University of Michigan USA and has been validated by another study done 2008, in Safdarjung hospital New Delhi. (8) This questionnaire contains questions pertaining to demographics, present or past medical history, family history of snoring or apnoea, sleepwalking, sleep terror nightmares or bedwetting. It included questions of bedtime such as how long it takes to fall asleep, usual bedtime, wake time. It included 61 questions related to bedtime behaviours and associations sleep behaviour, morning waking behaviours and any associated problems, daytime behaviours. Each question was rated as usually(5 to 7),sometimes (2 to 4), and rarely(0to1).It included questions for teachers and the parent was asked to get teachers observations on excessive activity, napping short attention span, falling grades marked as yes/no and duly filled in by their class teacher.

SDB was defined as being clinical present if even one of the following symptoms were present ie snoring, snorting, troubled sleep due to difficulty in breathing, breathing with open mouth, dry mouth on awakening grinding.

Sleep patterns contributing to development of BIC were divided into a) sleep association habits i.e. either needing rocking rhythmic movements to sleep, needing an object or a parent to sleep. b) Inadequate limit setting was stalling either due to struggling/resisting sleeping or stalling because of any fears.

Sleep patterns either sleep association or inadequate limit setting if associated with night awakenings or symptoms of daytime sleepiness were considered fulfilling the spectrum of BIC.

The morning symptoms on awakening , suggestive of poor sleep included for the study were feeling un refreshed, headaches .negative mood and taking a long time in becoming alert (decreased alertness), on awakening.

The parameters of daytime behaviour that were included for the study were decreased concentration, inattention and fatigue.

Symptoms suggestive of daytime sleepiness that were included were daytime naps, frequent complaints of daytime sleepiness, falling asleep during active behaviour, unable to move for short time despite being fully awake.

Night awakening was considered when the parent or child complained of night awakening once or more than once, night awakening by crying or with screams or due to dreams was taken into account and or any other complaints of sleeping problems at night that suggested awakenings .These were all grouped under night awakenings.

Statistical Methods

Statistical analysis was done by using SPSS software version 16. Correlational Associations were determined using Karl Pearson’s correlation test. The level of significant was set at $p < .05$. Prevalence was determined using frequency function in descriptive analysis test.

RESULTS

TABLE 1: DEMOGRAPHIC DATA

Age	N	Minimum	Maximum	Mean	SD
	201	5.00	14.00	8.6219	2.41895
Gender	N	Male	Female	M%	F%
	201	107	94	53.2	46.8

TABLE 2: OVERALL DISTRIBUTION OF SYMPTOMS OF SDB AND BIC

SYMPTYOMS S/O SDB	FREQUENCY	%
		64
HABITS S/O BIC	111	55.2

TABLE 3: DISTRIBUTION OF SYMPTOMS OF SDB

SYMPTOMS	FREQUENCY	%
SNORES	20	10
TROUBLE SLEEPING	13	6.5
SNORTS	27	13.4
BREATHES OPEN MOUTH	40	19.9
DRY MOUTH	21	10.4
GRINDS	19	9.5

TABLE4: DISTRIBUTION OF SLEEP ASSOCIATION HABITS

Sleep onset associations	Frequency	Percentage
Rocking /rhythmic movement	4	2
Needs object to sleep	6	3
Needs parents	70	34.8

TABLE 5: DISTRIBUTION OF SLEEP PATTERN C/T BIC: INADEQUATE LIMIT SETTING

	FREQUENCY	%
RESISTS /STRUGGLES	25	11.4
AFRAID OF DARK/STALLING	74	36.8

C/T: CONTRIBUTING TO

TABLE 6: DISTRIBUTION OF NIGHT AWAKENING

	FREQUENCY	%
ONCE	30	14.9%
MORE THAN ONCE	37	18.4%
AWAKES CRYING SCREAMING	5	2.5%
AWAKES DUE TO DREAMS	6	2.5%

TABLE 7: DISTRIBUTION OF MORNING SYMPTOMS

	FREQUENCY	%
FEELING UNREFRESHED	16	8
HEADACHE	22	10.9
NEGATIVE MOOD	19	9.5
DECREASED ALERTNESS	20	10

Decreased Alertness: when child takes a long time to become alert in the morning

TABLE 8: DISTRIBUTION OF DAY TIME BEHAVIOUR

	FREQUENCY	%
DECREASED CONCENTRATION	49	24.4
INATTENTION	11	5.5
FATIGUE	45	22.4

TABLE 9: DISTRIBUTION OF MEDICAL CONDITIONS

	FREQUENCY	%
ENLARGED TONSIL	19	9.5
ALLERGY	11	5.5
ASTHMA	9	4.5

TABLE 10: DISTRIBUTION OF PATTERN OF DAYTIME SLEEPINESS

DAYTIME SLEEPINESS	FREQUENCY	%
NAPS	81	40.3
C/O SLEEPINESS	50	24.9
FALLING ASLEEP	9	4.5

TABLE 11: CORRELATION OF SYMPTOMS OF SDB WITH MEDICAL CONDITIONS

SYMPTOMS OF SDB	MEDICAL CONDITION	r	p
SNORES	ENLARGED TONSIL	.177	.012
	ALLERGY	.177	.049
	ASTHMA	.169	.016
TROUBLE SLEEPING	ALLERGY	.292	.000
	ASTHMA	.334	.000
SNORTS	ENLARGED TONSILS	.172	.015
	ALLERGY	.226	.001
	ASTHMA	.267	.000
BREATHES WITH OPEN MOUTH	ALLERGY	.209	.003
	ASTHMA	.374	.000
DRY MOUTH	ASTHMA	.241	.001

Snoring and snorting were positively correlated with all 3 medical conditions ie enlarged tonsils, allergy and asthma open mouth breathing and trouble sleeping was positively correlated with allergy and asthma. Dry mouth on awakening was positively correlated with asthma.

TABLE 12: CORRELATION OF SYMPTOMS OF SLEEP DISORDERED BREATHING WITH DAYTIME BEHAVIOUR

SDB	DAYTIME BEHAVIOUR	R	p
SNORES	INATTENTION	.139	.049
	FATIGUE	.220	.002
SNORTS	DECREASED CONCENTRATION	.150	.033
OPEN MOUTH BREATHING	FATIGUE	.181	.010
GRINDS	FATIGUE	.153	.030

Snoring, open mouth breathing and grinding were positively associated with fatigue ,snoring in addition with inattention and snorting with decreased concentration.

TABLE 13: CORRELATION OF SYMPTOMS OF SLEEP DISORDERED BREATHING WITH MORNING SYMPTOMS

SLEEP DISORDERED BREATHING	MORNING SYMPTOMS	r	p
OPEN MOUTH	HEADACHE	.145	.041
	NEGATIVE MOOD	.180	.011
	DECREASED ALERTNESS	.209	.003
DRY MOUTH	HEADACHE	.245	.000
	NEGATIVE MOOD	.168	.017
	DECREASED ALERTNESS	.158	.025
	FEELING UNREFRESHED	.200	.004
GRINDS	DECREASED ALERTNESS	.177	.012

Open mouth breathing during the day, dry mouth on waking up ,grinding teeth during sleep had a positive correlation with decreased alertness ie taking a long time to become alert in the

morning. Dry mouth in the morning and open mouth breathing was positively correlated with headache and negative mood on waking up in the morning
 Dry mouth on waking up additionally was also positively associated with feeling un refreshed on waking up

TABLE 14: CORELATION OF HABITS C/T BIC WITH DAYTIME BEHAVIOUR

BIC	DAYTIME BEHAVIOUR	R	p
ROCKING/RYTHMIC MOVEMENTS	INATTENTION	.279	.000
NEEDS PARENT TO SLEEP	INATTENTION	.146	.039

Sleep association patterns c/t (contributing to) BIC ie rocking/rythmic movements and needing parents was positively correlation with night awakening and daytime behaviour of inattention

TABLE 15: CORRELATION OF SLEEP HABITS C/T BIC AND NIGHT AWAKENING

SLEEP ASSOCIATION HABITS	NIGHT AWAKENING	r	p
ROCKING /RYTHMIC MOVEMENTS TO SLEEP	NIGHT AWAKENING ONCE	.140	.047
	C/O SLEEPING PROBLEMS	.191	.007
NEEDS PARENTS TO SLEEP	C/OSLEEPING PROBLEMS	.245	.000

Sleep association patterns c/t (contributing to) BIC ie rocking/rythmic movements and needing parents were positively correlated with night awakenings atleast once and complains of sleeping problems

Table 16: CORRERATION OF SYMPTOMS OF SDB AND NIGHT AWAKENING

SDB	NIGHT AWAKENING	R	p
SNORES	C/O SLEEPING PROBLEMS	.223	.001
	AWAKENING CRYING/SCREAMS	.267	.000
	AWAKENING B/O DREAMS	.267	.000
TROUBLED SLEEPING	C/O SLEEPING PROBLEMS	.183	.009
	AWAKENING CRYING/SCREAMS	.348	.000
	AWAKENING B/O DREAMS	.478	.000
SNORTS	NIGHT AWAKENING ONCE	.163	.021
	C/OSLEEPING PROBLEMS	.259	.000
	AWAKENING CRYING/SLEEPING	.218	.002
	AWAKENING B/O DREAMS	.312	.000
BREATHES WITH OPEN MOUTH	NIGHT AWAKENING ONCE	.246	.000
	AWAKENING CRYING/SCREAMS	.240	.001
	AWAKENING B/O DREAMS	.320	.000
DRY MOUTH ON AWAKENING	NIGHT AWAKENING ONCE	.313	.000
	AWAKENING CRYING/SCREAMS	.259	.000
	AWAKENING B/O DREAMS	.363	.000
GRINDS	AWAKENING CRYING/SCREAMS	.167	.018
	AWAKENING B/O DREAMS	.276	.000

All symptoms of SDB were positively associated with some pattern of night awakening

TABLE 17: CORELATION OF SLEEP ASSOCIATION HABIT OF ROCKING /RYTHMIC MOVEMENTS AND SLEEP INITIATION IN MORE THAN 20 MINS

SLEEP ASSOCIATION	SLEEP TIME	r	p
ROCKING /RHYTHMIC MOVEMENTS	SLEEPING INITIATION IN MORE THAN 20 MIN	.258	.000

Rocking/rythmic movements was positively correlated with sleeping initiation of more than 20 mins

TABLE 18: CORELATION OF DAYTIME SLEEPINESS WITH DAYTIME BEHAVIOR

DAY TIME SLEEPINESS	DAYTIME BEHAVIOUR	r	p
NAPS	FATIGUE	.264	.000
C/O SLEEPINESS		.354	.000
FALLING ASLEEP		.172	.014

Symptoms of Day time sleepiness i.e. naps, sleepiness and falling asleep were all positively correlated with Day time behavior of fatigue

DISCUSSION

Sleep is an essential physiological mechanism of rest for conserving energy and restoring physiological functions. It is essential for a primary care physician to know about normal developmental changes in sleep patterns, distinguish them from sleep problems and identify consequences of poor sleep. Equally important for both the physician and the caregiver is knowledge of essential sleep hygiene practices, which promote behavioural and environmental habits to bring about adequate sleep duration and quality

Newborns require 16-18hours of sleep per day & schedule is influenced by hunger & satiety. By 3months they become more sensitised to dark light cues and shift from polphasic sleep to more consolidated nocturnal sleep

Infants of 6-9months sleep 14-16hr, 20% of infants & toddler wakeup at least once per night and 50% waking up at least one night per week. ⁽⁹⁾ Pattern of daytime naps also changes from 2naps/day to 1nap/day at end of toddler day.

6mo-2yr of age is marked by developmental attachment to caregiver, separation anxiety & development of internal working module of sleep

In early childhood total sleep duration decreases to 13-11 hours. 10% wake up once per night, however in our study we found 14.9% of subjects waking up at least once, and 18.4% waking up more than once. This age group is increasingly sensitised to reward and punishment. School children (6-11yr) sleep about 10-11hours, daytime napping is rare. ⁽¹⁰⁾ Less than 10% of 6yr old nap. ⁽¹¹⁾ Girls sleep more than boys ⁽¹²⁾ and less than 10% of 6yr old nap. ⁽¹¹⁾ Sleep in school going age group age is affected by school social obligations and multiple bedtime stimulating activity and peer relationships leading to negative associations and increased bedtime arousals. This along with other factors in school children ie delayed sleep onset increased time in bed leads to psychophysiological insomnia as a result of conditioned anxiety

around difficulty in falling asleep, staying asleep, emotional arousal and negative associations in sleep thus, developing poor sleep habits

Adolescent undergo a delay in time of sleep by 2hours by biological and social factors. The biological factor is hypothesised to be delayed release of melatonin. ⁽¹³⁾ 20-30% children in cross sectional studies have significant bedtime sleep problems and in most cases have behavioural cause and solution. Behavioural sleep problems are seen in all age group. Behavioural sleep problems typically present with at least one of the following: bedtime stalling or resistance, difficulty in falling asleep, night awakening or excessive day sleepiness.

25% of children experience difficulty with some aspects of sleep. ⁽¹⁴⁾ 27% of children in USA are sleeping less than recommended for all ages. ⁽¹⁵⁾ There is high prevalence of 20-30% behavioural insomnia the most common sleep disorder. Prevalence is lower for sleep apnoea 1 to 3%. sleep related movement disorder 2-8%, parasomnia such as night terror 5-35%. ⁽¹⁶⁾ Suri JC in his study conducted in Delhi ⁽⁸⁾ found the overall prevalence of SDB to be 4.8% and that of snoring to be 12.7%. Additionally SDB was positively correlated with enlarged tonsils, tonsil surgery, nasal allergy and asthma. He conducted polysomnography in a subgroup of 50 children who snored {a number considered statistically significant} as snoring was considered high risk of SDB.

In this study 31.8 % (64 patients) were found to have at least one symptom s/o SDB i.e. Snoring, trouble sleeping, snorting, open mouth breathing, dry mouth on awakening and grinding. Snoring was reported in 10 % of the patients. There was a significant positive correlation of symptoms of SDB with medical conditions, with symptomatic problems on morning awakening, day time behaviour and night awakening.

Snoring, open mouth breathing, grinding were all associated with daytime

fatigue, additionally snoring was associated with inattention and snorting with decreased concentration.

All symptoms of SDB were positively correlated with an average of at least 3 patterns of night awakening.

Behavioural patterns, i.e. Sleep association habits or problems with limit setting contributing to the development of BIC in children were seen in 111 (55.2%) children. The children in our study were 6 years and above however 2% still needed rocking/rhythmic movements to sleep, 3% needed an object to sleep and 34.8% needed one parent to sleep. 11.4 % children reported stalling either by struggling or other resistance. 36.8% children reported stalling as they were afraid of dark.

Rocking rhythmic movements for sleep or needing parent to sleep were sleep association habits which were positively correlated with night awakening and daytime behaviour of inattention. Sleep association habits of rocking /rhythmic movements delayed initiation of sleep by more than 20 min.

Night awakenings were seen to be positively correlated with all symptoms of SDB and with sleep association habits of rhythmic /rocking movements and needing a parent

Daytime inattention was positively correlated with symptom of SDB (snoring) and BIC forming habit (sleep association)

Daytime sleepiness was positively correlated with daytime fatigue, which was also positively correlated with at least 3 symptoms of SDB (open mouth breathing, grinding teeth in sleep and snoring)

Only 3 patients (1.4 %), actually sought help for sleep disruption due to medical condition of enuresis, thereby indicating a lack of awareness of sleep associated problems.

CONCLUSION

A sleep history is necessary for prevention and intervention for sleep problems. Routine screening for sleep

problems should be done in specific medical conditions and behavioural disorders.

Recognition of sleep problems is essential as all symptoms indicating poor sleep quality may not be present. There maybe one or more daytime behaviours or morning symptoms associated with sleep problems secondary to SDB and BIC.

Parental education regarding normal developmental patterns, persistence of associations and sleep hygiene practices ie appropriate sleep conducive environment, avoidance of technology, regular sleep routines, preventing delays of sleep initiation beyond 20 to 30 minutes is needed to prevent sleep related problems.

Limitations

This was a questionnaire based cross sectional study ,hence only subjective interpretations of parents supported by interpretations of the child in some cases of symptoms was possible and objective criteria to diagnose sleep disorders was not done. Hence this study could highlight sleep problems that could potentially lead to sleep disorders. This study was limited to a special cohort of patients, therefore was limited in its sample size.

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