

Reports

Sleep and children's development in India

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Change in lifestyle, late marriage and various other reasons results preterm baby, caesarean baby and various birth defects. Further children's health is becoming fragile due to change in food habits like: regular use of snacks, caffeinated drinks, fast foods, inorganic foods etc., use of plastics as food vessels, use of antibiotics, due to lesser physical activity, lesser play, and stressful study routine etc. Proper sleep to a large extent makes body evolve and adapt to the changed requirements. But due to late night sleeping of parents and opening of schools in early morning, children are sleeping inadequately. All these are making havoc pressure on children's health, causing collapsing of immunity, physical health, mental health etc. This article explains basic importance of proper sleep and way to have it. As our topic is of common interest, we have kept our words simple and matter conclusive.

Sleep is a naturally repeated process of mind and body which is characterized by changed consciousness, relatively repressed sensory activity, inhibition of voluntary muscles and reduced interactions with the surroundings. It can be distinguished from being awoken by a decreased ability to react to stimuli, but is more easily reversed than the state of being comatose. It plays important role in physiology of the body like growth, immunity, sexual acts, mental and biological health. It further helps to evolve and adapt to the changed requirements.^{1,2}

Children should be made to sleep early and must be allowed to sleep as much as they can, till late in the morning. But nowadays Indian children are not sleeping adequately as shown in [Table 1](#) and [Table 2](#). Further opening of school in early morning is aggravating the problem.³ The National Sleep Foundation Scientific Advisory Council recommends 9 to 11 hours for school age children and 8 to 10 hours for teenagers.⁴ This leads to collapse of overall health resulting in rapid rise of various infections and asthma cases, poor body mass index (BMI), poor concentration in studies, lower creativity, higher aggressiveness and restlessness in children. For adults there are many complex issues for getting asleep but children in general fall asleep easily, so it is much easier for a child to have adequate sleep. A robust health in childhood leads to healthy and productive adulthood, hence better performing society. So, urgent attention is needed to understand children's health requirement in order to better our being. The first two decades of human life comprises of tremendous and complex biological progress, which promotes all aspects of human existence. Proper sleeping aids in almost all this progress.²

SLEEPING PATTERNS OF INDIAN CHILDREN

There is not much study and attention on sleeping needs of children. But since last few years there is growing concern in this regard and some study has been done to study sleep among children. Though globally there is problem of inadequate sleeping among children, but in India the problem is more severe. First we will see sleeping patterns among children in few important countries, as is shown below in [Table 1](#).⁵

[Table 1](#) clearly shows that Night Time Sleep duration among Indian children is least amongst studied nations and Indian children are comparatively sleeping late. Hence inadequacy of sleep among Indian children is more severe. But as in this study the data were majorly collected online, so the respondents comparatively may be from group using internet and other screen appliances more, and other study clearly confirms that more screen time has adverse effects on sleep. So the data may be a little bit more adverse, in this age group of children. Further the data would have been even more adverse if it included school going children, as many private schools open early in the morning, at around 7 am.

Recently one study was done by Mishra et al, 2017,⁴ which studied sleep patterns among Indian children as is shown below in [Table 2](#).

The above study also shows that Indian children are sleeping less but it is not that severe as shown by Mindell et al, 2013 ([Table 1](#)). The data may be less adverse as private school going children were not studied, which in general open early in the morning at around 7 am and thus would have resulted a more adverse data. Also as the data is taken from government school located in sub-urban area around Lucknow, where Midday Meal Scheme was implemented,

Table 1. Sleep patterns (mean $\pm$ standard deviation) among children of age 3 to 6 years across some country⁵

Country or region	N	Bed time	Wakeup time	Night time sleep
Australia/New Zealand	286	7.83 $\pm$ 0.78	6.95 $\pm$ 0.71	10.73 $\pm$ 0.87
Canada	272	8.38 $\pm$ 0.93	7.28 $\pm$ 0.82	10.45 $\pm$ 0.96
China	248	9.65 $\pm$ 0.81	7.36 $\pm$ 0.90	9.47 $\pm$ 0.99
Hong Kong	82	10.18 $\pm$ 0.71	7.87 $\pm$ 0.99	9.41 $\pm$ 1.11
India	294	10.44 $\pm$ 1.02	7.67 $\pm$ 1.03	8.96 $\pm$ 1.10
Japan	148	9.08 $\pm$ 0.83	7.32 $\pm$ 0.76	10.04 $\pm$ 0.90
South Korea	312	9.91 $\pm$ 1.05	7.98 $\pm$ 0.94	9.69 $\pm$ 1.02
Malaysia	121	10.17 $\pm$ 1.18	7.63 $\pm$ 1.05	9.11 $\pm$ 1.23
Philippines	76	9.99 $\pm$ 1.26	7.91 $\pm$ 1.53	9.57 $\pm$ 1.22
Singapore	81	9.77 $\pm$ 1.01	7.59 $\pm$ 0.83	9.25 $\pm$ 1.15
Thailand	88	8.97 $\pm$ 0.96	6.88 $\pm$ 0.79	9.35 $\pm$ 1.08
United Kingdom	298	7.71 $\pm$ 0.64	7.02 $\pm$ 0.65	10.88 $\pm$ 0.96
United States	284	8.63 $\pm$ 1.01	7.28 $\pm$ 1.00	10.16 $\pm$ 1.09
Total	2590	9.10 $\pm$ 1.33	7.40 $\pm$ 0.96	9.93 $\pm$ 1.22

where in general children from low income group family study and parental profile also suggests that the children are from low income group family. So there may be less distraction for sleeping like screen time, parents not sleeping late etc. Further children with chronic illness were excluded from the study and inadequate sleep is more severe in children who are not healthy. This study also tells us that children are sleeping more during weekends this means children in general are sleep deprived during weekdays. So we can say that children in general are in sleep dept.

One study by Barathy et al found that major culprit to children's sleep are lesser physical activity and more screen time.⁶ Further there are many health issues increasing among children that have direct relation with sleep. Their relationships with sleep are explained below.

BENEFITS OF ADEQUATE SLEEP

SLEEP IMPROVES IMMUNITY

Our immune systems works best during sleeping hours. Children who sleep adequately have fewer infections and if infected gets well quickly.⁷ Also during sleeping our immune systems get adept to newer infections and newer requirement,⁸⁻¹⁰ which has arisen due to changed food products because of increase in inorganic farming, application of various vaccines which alters immune system, changed life styles etc. During infection our body needs more sleep as our immune system has to work more, by reducing wastage of energy on other activity, so that our body can concentrate better in fighting infection. Adequate sleeping also negates inflammation,¹¹ which are cause of many other ailments. Children who get adequate sleep have lesser risk to develop asthma and other allergies.¹²⁻¹⁴ Even if due to inadequate sleeping a child health has deteriorated, it can be regained to a large extent by again following good sleeping habits.

SLEEP PREVENTS EARLY PUBERTY

Since last 40 -50 years, early puberty is becoming major concern. If a child gets sexual initiation at an early age, it disturbs his/her psychological and social well being. Early puberty alters biological clock leading to lower life expectancy, shorter height^{15,16} and altered growth. Early puberty makes one prone to various diseases that include even some types of cancer, especially breast cancer. Higher intake of animal food and fatty items significantly promotes early puberty. Abnormal intake of dairy products should also be avoided. These foods contribute to higher level of fats in the body and hence higher level of estrogen or testosterone in children's body. Hence care must be taken so that children's diets are majorly based on plant foods with little supplement of milk (250 ml to 400 ml per day). Animal foods should be avoided to keep sex hormones level at safer zones. Here again sleep plays an important role as children having proper sleep have better eating habits.¹⁷ Proper sleep in general helps in keeping body lean¹⁸⁻²¹ with healthy BMI,²²⁻²⁵ hence prevents early puberty.

SLEEP HEALS

Due to learning of various physical activities and with their higher physical activity, children get injured very often. It has been shown through various research that sleep aids in healing.^{26,27} So children who have adequate sleep get well quickly, hence lesser need of medical care. Enabling them robust physical activity, hence better health and growth. Due to various metabolic mechanisms in our body, toxins are produced. Sleep helps excrete toxins and waste from body especially from brain,²⁸ thus helps in getting a child refreshed.

SLEEP IMPROVES BRAIN FUNCTIONS

Proper sleep enhances brain growth.²⁹ Sleep helps removal of neurotoxic waste products that accumulate in the awake

central nervous system,²⁸ thus improves brain efficiency and makes us fresh, so that we can deal with stress and various emotional challenges.^{30,31} Adequate sleep is the basis for curing many types of psychiatric problems in children like autism,³² ADHD,¹⁴ OCD, anxiety, depression,^{33,34} etc. And a child who gets adequate sleep seldom suffers from such ailments. Children who have adequate sleep, have better memory, better learning power and creativity, hence better school performance.^{35,36} Proper sleeping also reduces risky behaviors.³⁷ Brain benefits most from the sleep. Hobson phrased this to the point in a title of a Nature paper: Sleep is of the brain, by the brain and for the brain.² Poor sleep is the major reason for deteriorated cognitive performance, neuronal diseases and even increased mortality.³⁸

SLEEP ENABLES PROPER GROWTH

New born who have longer sleeping duration have higher body length.³⁹ Another study shows that lean adolescent (10-11 years) who sleep adequately achieve higher body length.⁴⁰ Even if a child has physical illness or psychological problems due improper sleep, he/she can regain health to a large extent by having adequate sleep, by following sleep hygiene and behavioral treatment.⁴¹

DISCUSSION

All these points conclude that a child who sleeps adequately performs better in almost all aspects like learning, creativity, physical activity, social activity etc. Almost each physical and psychological aspects gets boost with better sleeping. Hence sleep is the fundamental requirement of a child health and parents should learn its importance along with ways to keep proper sleep hygiene, so that a child can have adequate sleep. Stressing on other aspects of child development like schooling, tuitions, food, physical activity etc., but ignoring sleeping aspect would backfire, hence waste of efforts and loss in human performance.

Even if some aspects of a child health have already deteriorated because of inadequate sleeping, most of it can be regained with adequate sleeping. So parents must ensure that their child sleep adequately by making arrangements so that they falls asleep early; by maintaining proper sleep hygiene, by removing disturbances like television, smart-phone, light etc. For this if needed parents may sleep along with the child in the evening, till the a child falls asleep, which generally takes 20-30 minutes, there after parents may get up and do normal activities. In the morning chil-

dren should not be forcibly woken up, they should be allowed to sleep at full length. If the school timing does not allow a child to sleep at full length in the morning, evening sleeping timing must be adjusted. Inadequate night sleeping should not be compensated with day time napping. Night time sleeping in a single stretch is a wholesome sleep. In fact frequent day time napping is an indication of inadequate night sleeping. Also frequent day time napping makes it difficult to have complete night time sleep. Simultaneously we must keep in mind that normal physical activity plays an important and complementary role in having adequate sleep.

Though proper sleep plays fundamental role in a child development; working on other aspects like healthy eating habits, physical activities, learning techniques and social aspects should not be ignored. Instead sleeping should be understood as the back-bone of child development, ultimately leading to human development.

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The authors have completed the Unified Competing Interest form at http://www.icmje.org/coi_disclosure.pdf (available on request from the corresponding author) and declare no competing interests.

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Table 2. Sleep pattern (mean $\pm$ standard deviation) in different age groups of children⁴

Sl. No.	Age group (Years)	Participants	Timing	Boys	Girls	Total mean sleep	P-value
1.	4-5	n=175	Bed time (weekday)	10.0 $\pm$ 0.9	9.9 $\pm$ 1.1	9.6 $\pm$ 1.0	0.38
			Wakeup time (weekday)	7.0 $\pm$ 0.80	7.4 $\pm$ 1.9	7.1 $\pm$ 1.3	0.18
		Boys=115	Night Time Sleep (weekday)	9.1 $\pm$ 1.0	9.5 $\pm$ 1.4	9.2 $\pm$ 1.2	0.03
			Bed time (weekend)	10.0 $\pm$ 1.2	10.0 $\pm$ 1.4	10.0 $\pm$ 1.3	0.90
		Girls=60	Wakeup time (weekend)	9.1 $\pm$ 1.1	9.4 $\pm$ 1.3	9.2 $\pm$ 1.2	0.11
			Night Time Sleep (weekend)	11.1 $\pm$ 0.5	11.4 $\pm$ 0.6	11.2 $\pm$ 0.6	0.003
2.	6-10	n=540	Bed time (weekday)	9.9 $\pm$ 1.1	9.9 $\pm$ 0.9	9.9 $\pm$ 1.0	0.64
			Wakeup time (weekday)	7.0 $\pm$ 1.1	6.6 $\pm$ 0.9	6.9 $\pm$ 1.1	<0.001
		Boys=345	Night Time Sleep (weekday)	9.1 $\pm$ 1.1	8.7 $\pm$ 1.1	8.9 $\pm$ 1.1	<0.001
			Bed time (weekend)	10.6 $\pm$ 1.4	10.4 $\pm$ 1.0	10.5 $\pm$ 1.3	0.06
		Girls=195	Wakeup time (weekend)	9.1 $\pm$ 1.1	8.7 $\pm$ 1.0	8.9 $\pm$ 1.1	<0.001
			Night Time Sleep (weekend)	10.5 $\pm$ 0.9	10.3 $\pm$ 1.4	10.4 $\pm$ 1.1	0.11
3.	11-15	n=335	Bed time (weekday)	10.1 $\pm$ 1.0	10.1 $\pm$ 1.3	10.1 $\pm$ 1.1	0.86
			Wakeup time (weekday)	6.7 $\pm$ 1.1	6.9 $\pm$ 1.0	6.8 $\pm$ 1.1	0.02
		Boys=205	Night Time Sleep (weekday)	8.6 $\pm$ 1.2	8.8 $\pm$ 1.3	8.8 $\pm$ 1.3	0.07
			Bed time (weekend)	9.6 $\pm$ 1.0	10.3 $\pm$ 1.4	9.9 $\pm$ 1.2	<0.001
		Girls=130	Wakeup time (weekend)	8.6 $\pm$ 1.3	8.9 $\pm$ 1.4	8.7 $\pm$ 1.3	0.08
			Night Time Sleep (weekend)	10.9 $\pm$ 1.0	10.6 $\pm$ 1.2	10.9 $\pm$ 1.1	0.006
4.	Total participants	N=1050	Bed time (weekday)	10.0 $\pm$ 1.1	9.9 $\pm$ 1.1	9.9 $\pm$ 1.0	0.63
			Wakeup time (weekday)	6.9 $\pm$ 1.1	6.8 $\pm$ 1.2	6.9 $\pm$ 1.1	0.19
		Boys=665	Night Time Sleep (weekday)	8.9 $\pm$ 1.2	8.9 $\pm$ 1.3	8.9 $\pm$ 1.2	0.51
			Bed time (weekend)	10.2 $\pm$ 1.4	10.3 $\pm$ 1.2	10.2 $\pm$ 1.3	0.14
		Girls=385	Wakeup time (weekend)	9.0 $\pm$ 1.2	8.9 $\pm$ 1.3	8.9 $\pm$ 1.2	0.36
			Night Time Sleep (weekend)	10.8 $\pm$ 0.9	10.6 $\pm$ 1.3	10.7 $\pm$ 1.1	0.03



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