

SLEEP DISORDER – THE DISEASE OF THE MODERN WORLD LITERATURE REVIEW

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Abstract: Introduction: sleep is a behavioural state of perceptual freedom while being unavailable for the environment, accompanied by characteristic electroencephalographic changes, having the rapidly reversible potential to the state of vigilance (Zepelin, 1987). Short and long-term sleep disorders that are present in childhood may be the cause of many diseases. Aim: the aim of this study was to analyse the international literature and the presentation of the latest information on sleep disorders in children. Material and methods. this study is a compilation of data resulted after the review of the international specialty literature. The used bibliography comprises current studies that have been published recently in international journals. Results: although sleep-related complaints, poor quality and quantity of sleep affect most children, this is still an underdiagnosed problem. Sleep disorders listed previously, under the subtitle classification, can be considered the basis of sleep complaints. The frequency and incidence of each disorder varies according to age. The most common sleep disorder that affects the majority of children of different age groups is the obstructive sleep apnea syndrome. The incidence in school children, without pathological manifestation is of 2-3.5%. Discussion and conclusion. sleep disorders present a complex pathology that can have several causes, both in children and adults. After reviewing the specialty literature, we can say that in case of children, this pathology can be detected early and can be prevented properly. Due to the increased frequency, there is a global need for the creation of laboratories to detect sleep disorders.

Cuvinte cheie: tulburări de somn, adolescenți, preșcolari, disomnii, parasomnii

Rezumat: Introducere: somnul este o stare comportamentală a libertății perceptuale cu indisponibilitate pentru mediul înconjurător, acompaniat de modificări caracteristice electroencefalografice, având un potențial rapid reversibil spre starea vigilență (Zepelin, 1987). Tulburările de somn prezente în perioada copilăriei pe termen scurt și lung pot determina apariția unor boli cronice. Scopul lucrării: scopul acestui studiu a fost de a parcurge literatura de specialitate internațională și de a prezenta cele mai noi informații referitoare la tulburările de somn la copii. Material și metodă: autorii prezintă în această lucrare, datele obținute în urma parcurgerii literaturii de specialitate internațională. Literatura folosită include studii de actualitate și care au fost publicate în reviste de specialitate în perioada 2008-2012. Rezultate: acuzele legate de somn, calitatea și cantitatea necorespunzătoare de somn afectează majoritatea copiilor și totuși este o problemă subdiagnosticată. Din acest motiv devine din ce în ce mai mult centrul atenției în cadrul pediatriilor și a părinților. La baza acuzelor de somn pot sta tulburările de somn care au fost enumerate la clasificare. Frecvența și incidența fiecăruia se schimbă în funcție de vârstă. Cea mai frecventă tulburare de somn care afectează majoritatea copiilor de diferite categorii de vârstă este sindromul de apnee de somn obstructiv. Incidența la copii de vârstă școlară, fără patologie, este de 2-3,5%. Discuții și concluzii: tulburările de somn reprezintă o patologie complexă care poate avea mai multe cauze atât la copii cât și la adulți. În urma parcurgerii literaturii de specialitate putem spune că în cazul copiilor această patologie poate fi depistată precoce și poate fi prevenită în mod corespunzător. Datorită frecvenței tot mai crescute, se necesită la nivel mondial înființarea unor laboratoare de depistare a tulburărilor de somn.

Sleep is a behavioural state of perceptual freedom while being unavailable for the environment, accompanied by characteristic electroencephalographic changes, having the rapidly reversible potential to the state of vigilance (Zepelin, 1987). In the Romanian medical dictionary, sleep is defined as a periodic and reversible physiological state characterized by somatic inactivity, relative and temporary suppression of consciousness, accompanied by a more or less important abolition of sensitivity and the inhibition of vegetative functions.

Short and long term sleep disorders that are present in childhood may reduce cognitive functions, cause behavioural disorders, obesity or insufficient growth, increased cardiovascular risk and the development of diabetes mellitus.

All these possible consequences highlight the fact that the frequency of these sleep abnormalities, risk factors which contribute to the emergence of this condition and treatment possibilities or options for prevention should be evaluated.

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Sleep disorders commonly occurring in childhood signal an evolutionary stage and can be considered physiological. Thus, nightmares, sudden awakenings, nocturnal enuresis and sleep disorders due to separation anxiety can occur. If these phenomena become constant or occur because of pathological changes, the consequences of these sleep disorders are more frequent and vary according to age. In young children, the most common signs are hyperactivity, behavioural disorders and in older children, the symptoms are predominantly similar to those experienced in adulthood, increased drowsiness during the day. In the long term, cardiovascular diseases, emotional, behavioural or cognitive disorders can also appear.

The aim of this study was a review of the international literature and the presentation of the latest information on sleep disorders in children.

This study is a compilation of data resulted after the review of the international specialty literature. The used bibliography comprises current studies that have been published recently in international journals.

Classification of sleep disorders

The first official classification, also recognized internationally, was described in 1979 by the Association of Sleep Disorders Centres, (ASDC).(13) They distinguished 67 diagnoses classified in four large groups, but these diagnoses were based mainly on clinical symptoms, which is why many overlaps occurred.

In 1986, the American Psychiatric Association distinguishes for the first time in the Manual for diagnosis and mental disorders statistics (DSM III) dyssomnia, or disorders of initiating or maintaining sleep from parasomnia, which are behavioural disorders during sleep. DSM IV classifies primary sleep disorders (dyssomnia, parasomnia), sleep disorders associated with other mental disorders (resulting from a diagnosed mental illness) and sleep disorders due to some general medical conditions.

Nowadays, the most widely used and accepted international classification is the one released by the American Sleep Disorders Association (ASDA).(2)

International classification (1997) (2,16):

Dyssomnia: are primary disorders of initiating or maintaining sleep or excessive drowsiness, which is characterized by a quantitative, qualitative disorder or disturbed rhythm of sleep.(1) It is assumed that these disturbances appear because of an impairment of the central nervous system (segment responsible for sleep). This section includes: primary insomnia, primary hypersomnia, narcolepsy, sleep disorders correlated with breathing, sleep-wake rhythm disorders.(15) The term "primary" implies that sleep disorder appears to be independent of any other known somatic or mental condition.

According to causes, we can distinguish 3 subgroups:

1. Intrinsic causes: e.g. obstructive apnea, central apnea, restless leg syndrome or Wittmaack-Ekbom syndrome or nocturnal myoclonus, (PLMD = Periodic Limb Movement Disorder) involuntary movements of the upper and lower limbs during sleep (during non-REM stages), narcolepsy, primary insomnia, etc.(10)
2. Extrinsic causes: e.g. poor sleep hygiene, insufficient sleep quantity, difficulties with falling asleep due to some improper habits, feeding at night.
3. Circadian rhythm disorders: e.g. changing time zones, delayed sleep phase syndrome.

Parasomnia: an essential abnormal event occurring either during sleep or on the verge of vigilance and sleep. It focuses on disturbances and not on its effects on sleep and

vigilance.(20) These phenomena occur at awakening, partial awakening or changing sleep phases and are generally manifestations of the central nervous system activation (especially by muscular activity or changes of the vegetative system).

Types of parasomnia:

1. **Waking disorders:** they have in common abnormal awakening and they begin during deep sleep, with slow waves. They can present the following manifestations:

- **Confused awakenings:** appear in the first period of the night and are characterized by confusion during and after waking up from sleep. In addition to these, the following symptoms may also appear: disorientation in time and space, slow speech, slow thinking, delayed responses to commands or questions, memory loss or behavioural disturbances, which last for a few minutes to several hours.

- **Pavor nocturnus:** are episodes of sudden awakening accompanied by sensations of terror and panic, shouting, crying, body movements, tachycardia, tachypnea, sweating. Usually, it occurs during the first third of sleep and can last for a couple of minutes. Remembering the event, if there is any, is limited..

- **Sleepwalking:** is an altered state of consciousness when the phenomena of sleep and wakefulness are combined. It is characterized by involuntary movements and walking in the state of deep sleep. During this episode, facial expression is not present, the eyes are fixed and awakening is difficult, without the recall of the episode.

2. **Disorders of the transition period between the state of being asleep and awake:** e.g. myoclonus when falling asleep, cramps in the legs, talking in sleep.

3. **Parasomnia associated with REM sleep:** it usually occurs during the REM phase (Rapid Eye Movements) of sleep.

- **Behavioural disorders:** it is characterized by an intermittent loss of REM phase atonia and the occurrence of developed motor activities (hitting, jumping, running) associated with the dreaming state.

- **Recurrent isolated sleep paralysis:** consists of a period of inability to perform voluntary movements, which may occur during falling asleep or awakening.

- **Nightmares:** they are experiences of dreams overloaded with fear, which lead to sudden awakening with alertness and quick orientation. Remembrance is detailed and vivid and dreams intensely frightening.

4. **Other parasomnias are:** e.g. nocturnal enuresis, bruxism, catathrenia, hallucinations, feeding disorders.

Sleep disorders due to a medical condition:

1. Psychiatric diseases: e.g. anxiety disorders, mood swings
2. Neurological diseases: e.g. sleep-dependent epilepsy, headache, Parkinson's disease, Huntington's disease, cerebrovascular diseases
3. Other diseases: endocrine (hyper-, hypothyroidism, hypo- or hyperadrenocorticism), viral or bacterial infections (hypersomnia in case of viral encephalitis), lung disease (chronic bronchitis), musculoskeletal diseases (rheumatoid arthritis, fibromyalgia).
4. Sleep disorders induced by the consumption of certain substances like: alcohol, amphetamines and related stimulants, caffeine, cocaine, opioids, sedatives, hypnotics, anxiolytics and others (adrenergic agonists

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and antagonists of dopamine, acetylcholine and serotonin, antihistamines, corticosteroids).

Sleep disorders that are not investigated so far: e.g. sleep disorders due to menstrual periods.

The frequency of complaints and sleep disorders in children

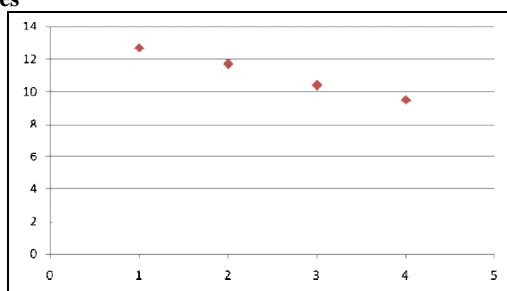
Different forms of sleep disorders affecting 25% of children around the world.(22) Temporary physiological symptoms at a certain age also belong to this category such as awakenings during the night, nightmares, and the most severe among primary and secondary sleep disorders, the obstructive sleep apnea syndrome. The pathology of this disorder recently is more and more often investigated. Some studies based on questioning parents, show a frequency of sleep disorders in young children (3-5 years of age) at 25-50% and 4 - 10 years of age 37%.(4,14) Based on a study performed in 14,000 schoolchildren regarding their complaints revealed the presence of the disorder in 20% (in 5 year old children) and 6% in 11 year old children.(18) Another study performed in a group of 8 - 10 year old children estimates the presence of symptoms in 43%.(8) Most studies are performed by questioning parents, which frequently underestimate the importance and severity of present complaints. During a self-evaluation, 12% of the teenagers considered that they have sleep disorders and 40% complained because of some symptoms of sleep disturbances.(9)

In the United States, the frequency of children who presented to medical services with sleep disorders was assessed. Based on the acquired data during one year, in 2930 patients of pediatric cases, 0.05% were diagnosed with sleep disorders and 0.01% were treated for insomnia (24), data showing that sleep disorders actually relatively common in children rarely are diagnosed in health care services, so they are probably underdiagnosed. There are several studies which describe the shortening of sleep time in children. In 2004, in the United States, the children under the age of 10 were assessed at the same time with adults regarding their sleeping habits. The results highlighted sleep insufficiency in each age category. Newborns spent 12.7 hours sleeping instead of 14 -15 hours, infants 1 - 3 years of age spent 11.7 hours sleeping instead of 12 -14 hours, children 3 - 5 years of age spent 10.4 hours sleeping instead of 11 -12 hours, and children 5 -10 years of age spent on average 9.5 hours sleeping instead of 10 -11.(22)

Table no. 1. The frequency of sleep disorders according to the type of evaluation

Age	Parents' opinion	Self-assessment	Clinical
3-5 years old	25-50%		
5-10 years old	37%		
> 10 years old	6%		
General		12-40%	0.05-0.01%

Figure no. 1. Average sleeping hours according to USA studies



Although sleep-related complaints, poor quality and quantity of sleep affect most children, this is still an underdiagnosed problem. This explains why pediatricians and parents become more and more interested in this problem. Sleep disorders listed previously, under the subtitle classification can be considered the basis of sleep complaints. The frequency and incidence of each disorder varies according to age.

Table no. 2. Complaints and sleep disorders by age groups (11,12)

	Newborns, infants 0-1 year	Young children 1-3 years	Children under school age 3-6 years	School-children 6-14 years	Teenagers >14 year
Respiratory sleep disorders	Sleep apnea in newborns (central) SIDS	The syndrome of obstructive sleep apnea during sleep			
Etiology	Perinatal disorders Immaturity of the CNS Gastro-esophageal reflux Respiratory infections	Adenoid hypertrophy			Obesity
Respiratory sleep disorders	Stereotypic movements disorders		Nightmare, Waking up suddenly	Bruxism	
	Abdominal colic	Disorders of initiating and maintaining sleep			Reversed biorhythm Narcolepsy
Etiology	Reversed biorhythm	Type of education	Separation anxiety Sexual abuse		Unknown origin

The most common sleep disorder that affects the majority of children of different age groups is the obstructive sleep apnea syndrome. The incidence in school-children, without pathological manifestation is of 2-3.5%.(5) We can highlight two peaks of incidence, one is in the age group of 2-8 years old, in whom the most common cause are adenoid hypertrophy and tonsillitis. The second peak is identified at the age of adolescence and is correlated with obesity. In young children, there are no differences between genders, but in case of teenagers, there is an increased frequency in boys.(6)

The assessment of sleep disorders can be performed by various methods. The results depend, among others, on the definition of sleep disorder, the surveyed person (child or parent) and age. The number of sleeping hours, however, is a more reliable indicator for detecting complaints.

Children with sleep disorders are more often hospitalized (6), present most commonly associated diseases (19), such as cardiovascular alterations, behavioural problems, poor school results.(3,7,21) These alterations and diseases can be considered as consequences of obstructive sleep apnea syndrome, because of the impact made on the period of sleep.

Sleep disorders present a complex pathology that can have several causes, both in children and adults. After reviewing the specialty literature, we can say that in case of children, this pathology can be detected early and can be prevented properly.

Many authors pay more attention to this disease, because sleep disorders can be the precursor to chronic diseases occurring in childhood. In most studies, clinicians diagnose by using the method of interrogation. Recently questionnaires corroborated with polysomnographic examination can give much valuable information that helps explicitly the pediatrician to detect the apparition of this pathology. Due to the increased

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frequency, there is a global need for the creation of laboratories to detect sleep disorders.

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REFERENCES

1. Allen C. Richert, MD, and Alp Sinan Baran, MD, A Review of Common Sleep Disorders, NS Spectrums - February 2003;(8)2.
2. American Academy of Sleep Medicine, 1997: The International Classification of Sleep Disorders, Revised. Diagnostic and Coding Manual. In: <http://www.esst.org/adds/ICSD.pdf>; 2005.
3. Archbold KH, Pituch KJ, Panahi P, Chervin RD. Symptoms of sleep disturbances among children at two general pediatric clinics. *J Pediatr.* 2002;140:97-102.
4. Blader JC, Kopelwicz HS, Abikoff H, Foley C. Sleep problems of elementary school children. A community survey. *Arch Pediatr Adolesc Med.* 1997;151:473-480.
5. Chang SJ & Chae KY. Obstructive sleep apnea syndrome in children: Epidemiology, pathophysiology, diagnosis and sequelae. *Korean J Pediatr.* 2010;53:863-871.
6. Goodwin JL, et al. Symptoms Related to Sleep-disordered Breathing in White and Hispanic Children > the Tucson Children's Assessment of Sleep Apnea Study. *Chest.* 2003;124:196-203.
7. Gozal D. Sleep-disordered breathing and school performance in children. *Pediatrics.* 1998;102:616-620.
8. Kahn A, et al. Sleep problems in healthy preadolescents. *Pediatrics.* 1989;84:542-546.
9. Levy D, Gray-Donald K, Leech J, Zvagulis I, Pless IB. Sleep patterns and problems in adolescents. *J Adolesc Health Care.* 1986;7:386-389.
10. Smith MA, Robinson L, Boose G, Segal R. Sleep Disorders and Sleeping Problems Symptoms, Treatment & Help for Common Sleep Disorders Last updated: January 2013.
11. Moore M, Allison D, Rosen CL. A review of pediatric nonrespiratory sleep disorders. *Chest.* 2006;130:1252-1262.
12. National Sleep Foundation: Information about Children's Sleep for Parents and Teachers. In: <http://www.sleepforkids.org/html/uskids.html>, 2004.
13. Novák M. Alvás-és ébrenlét zavarok diagnosztikája és terápiája. Budapest, OKKER; 2000. p. 87-92.
14. Owens JA, Spirito A, McGuinn M, Nobile C. Sleep habits and sleep disturbance in elementary school-aged children. *J Dev Behav Pediatr.* 2000;21:27-36.
15. Panossian LA, Avidan AY. UCLA Department of Neurology, UCLA Medical Centre, Los Angeles, CA 90095-1767, USA. Review of sleep disorders. *Med Clin North Am.* 2009 Mar;93(2):407-25.
16. Peraita-Adrados R. Advances in sleep disorders, *Rev Neurol.* 2005 Apr 16-30;40(8):485-91.
17. Richert AC, Baran AS. A review of common sleep disorders. *CNS Spectr.* 2003 Feb;8(2):102-9.
18. Rona RJ, Li L, Gulliford MC, Chinn S. Disturbed sleep: effects of sociocultural factors and illness. *Arch Dis Child.* 1998;78:20-25.
19. Ronksley PE, et al. Excessive daytime sleepiness is associated with increased health care utilization among patients referred for assessment of OSA. *Sleep.* 2011;34:363-370.
20. Roy H Lubit, MD, PhD Assistant Clinical Professor, Mount Sinai School of Medicine; Clinical Faculty, Department of Child Psychiatry, New York University School of Medicine; Sleep Disorders, Medscape, 2012 May 14.
21. Salorio CF, White DA, Piccirillo J, Duntley SP, Uhles, ML. Learning, memory, and executive control in individuals with obstructive sleep apnea syndrome. *J Clin Exp Neuropsychol.* 2002;24:93-100.
22. Sheldon H, et al. *Pediatric sleep Medicine.* USA, Elsevier; 2005. p. 29.
23. Thomas F, Anders MD, Lisa A, Eiben MS. Pediatric Sleep Disorders: A Review of the Past 10 Years *Journal of the American Academy of Child & Adolescent Psychiatry.* 1997;36(1):9-20.
24. Vignan J, et al. Epidemiologic study of sleep quality and troubles in French secondary school adolescents. *J Adolesc Health.* 1997;21:343-350.