Sleep Medicine Reviews 30 (2016) 63–71

Contents lists available at ScienceDirect

Sleep Medicine Reviews

journal homepage: www.elsevier.com/locate/smrv

CLINICAL REVIEW

Sleep disorders in children with cerebral palsy: An integrative review

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ARTICLE INFO

Article history:
Received 30 March 2015
Received in revised form
25 November 2015
Accepted 26 November 2015
Available online 11 December 2015

Keywords:
Child
Sleep disorders
Cerebral palsy

SUMMARY

Sleep disorders are more prevalent in children with cerebral palsy. The review aimed to identify and synthesize information about the nature of sleep disorders and their related factors in children with cerebral palsy. We performed an electronic search by using the search terms sleep/child*, and sleep/cerebral palsy in the following databases: Latin American literature on health sciences, SCOPUS, medical publications, cumulative index to nursing and allied health literature, psycinfo, worldcat, web of science, and the Cochrane library. The selection criteria were studies: available in Portuguese, English or Spanish and published between 2004 and 2014, with results addressing sleep disorders in children (ages 0–18 y) with a diagnosis of cerebral palsy. 36,361 abstracts were identified. Of those, 37 papers were selected, and 25 excluded. Twelve papers were incorporated in the study sample: eight quantitative studies, three reviews, and one case study. Eleven types of sleep disorders were identified, such as difficult morning awakening, insomnia, nightmares, difficulties in initiating and maintaining nighttime sleep (night waking), and sleep anxiety. Twenty-one factors were linked to sleep disorders, which we classified as intrinsic factors associated with common comorbidities accompanying cerebral palsy, and extrinsic aspects, specifically environmental and socio-familial variables, and clinical-surgical and pharmacological interventions.

Introduction

Sleep disorders occur in approximately 25% of typically developing children and are often reported by parents [1]. In samples of children with disabilities, the etiologies of sleep disorders are diverse [2]. Causes may include the extent and location of brain abnormalities, severity of developmental delay, any accompanying sensory loss, epilepsy, intellectual deficits, cerebral palsy (CP), attention-deficit–hyperactivity disorder (ADHD), autism, eating difficulties, and other neuropsychiatric health problems such as anxiety, hyperactivity, aggressive behavior, depression, and pain [3].

Environmental factors and caregivers' behaviors can also contribute to children's sleep disorders. Because treatments for sleep disorders associated with particular features vary it is vitally important to identify factors related to sleep disorders [4] in homogeneous samples of children with CP [5].

CP is a term representing a group of disorders relating to motor development due to non-progressive lesions of the developing brain, often accompanied by disturbances of sensation, cognition, and/or a seizure disorder [6]. Depending on the type of CP, 25–80% of children have additional impairments. Of those children, a large proportion has some level of intellectual impairment; the prevalence varies with the type of CP but increases when epilepsy is present [7]. Odding and colleagues indicated that epilepsy is present in 20–40% of CP cases and is most common among children with hemiplegic or quadriplegic CP. They also reported that up to 80% of children diagnosed with CP have some impairment of speech and almost 75% have low visual acuity. Half of all children diagnosed with CP have gastrointestinal and feeding problems, with inadequate growth occurring in 25%, while being under or overweight characterizes about 50% of children [7].

The higher prevalence of sleep disorders in children with CP has typically been represented by the following characteristics: sleep–wake transition disorders, excessive daytime sleepiness, and arousal disorders. Active epilepsy in children with CP has had the strongest correlation with sleep disorders, specifically with excessive daytime sleepiness [5].

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http://dx.doi.org/10.1016/j.smrv.2015.11.008
1087-0792/

Abbreviations

ADHD	attention-deficit–hyperactivity disorder
AHI	apnea hypopnea index
AI	arousal index
CBCL	child behavior check list
CSHQ	child sleep habits questionnaire
CINAHL	cumulative index to nursing and allied health literature
CP	cerebral palsy
EDS	excessive daytime sleepiness
EMG	electromyographic
GMFSC	gross motor function classification system
HB	hyperbolide
LILACS	Latin American literature on health sciences
NDD	neurodevelopmental disability
NTPE	night-time postural equipment
OSA	obstructive sleep apnea
PLMD	periodic limb movement disorder
PSG	polysomnograms
PSQ	pediatric sleep questionnaire
PSQI	Pittsburgh sleep quality index
REM	rapid eye movement
RLS	restless leg syndrome
SDB	sleep disordered breathing
SDSC	sleep disturbances scale for children
TBS	tongue base suspension
TD	typically developing

When children experience sleep deprivation they evidence mood, behavioral, and cognitive impairments [8,9]. Insufficient or inefficient sleep adversely affects cognitive tasks, such as executive control, attention regulation, and working memory [10].

Lower quality of life in children with CP has been associated with insomnia and excessive daytime sleepiness. Lower quality of life is linked with impaired physical, emotional, social, and school functioning; considering effects of sleep disorders in general is important to raise awareness about managing sleep in children with CP [11]. Therefore, it is important to review and synthesize scientific evidence about the nature of children's sleep disorders associated with CP and related factors.

Study question and purpose

This integrative review aims to provide a comprehensive review and synthesis of the research literature about sleep disorders and factors related to those disorders in children with CP. For the purposes of the review, a child is defined as a person between 0 and 18 y. The research questions were: What is the nature of sleep disorders and what factors are related to sleep disorders in children with CP?

Methods

An integrative review represents a method to summarize past research literature and to provide comprehensive understanding of an area [12]. In contrast to systematic reviews that include only quantitative studies, this method includes all study designs while still adhering to rigorous review processes [12–14]. It involves identification of research questions, a literature search, categorization and assessment of studies, interpretation of results, and synthesis of knowledge [14,15].

A systematic search was conducted using eight databases in the following sequence: Latin American literature on health sciences (LILACS), Scopus medical publications (PubMed), cumulative index to nursing and allied health literature (CINAHL), PsycInfo WorldCat Web of Science and the Cochrane library. Search terms were “sleep”, “child*” and “cerebral palsy”. The bibliographic survey occurred from June to the end of July, 2014.

The inclusion criteria for this review were studies: 1) available in Portuguese, English or Spanish; 2) addressing sleep disorders in children, with diagnosis of CP, aged between 0 and 18 y; 3) published between 2004 and 2014, and 4) examining factors associated with sleep disorders in the population of interest.

Papers were excluded if: 1) the manuscripts were editorials or letters to the editor, 2) the paper was not published in a peer-reviewed journal (e.g., abstracts or dissertations), and 3) there were repeated articles in subsequent databases.

Quality appraisal and synthesis

The articles were classified according to level of evidence: Level I (systematic review or meta-analysis of randomized controlled clinical trials or clinical guidelines based on systematic reviews of randomized controlled trials); Level II (at least one well-designed randomized controlled trial); Level III (well-designed clinical trials without randomization); Level IV (well-designed cohort and case-control studies); Level V (systematic reviews of descriptive and qualitative studies); Level VI (single descriptive or qualitative study) and; Level VII (opinions of authorities and/or report of expert committees) [16].

Results

Study sample

By using the broad search terms sleep and child*, and sleep and cerebral palsy, in eight databases, 36,361 abstracts were identified. Based on a review of titles and study abstracts, 36,324 were excluded because they included primarily adults (n = 20,300), did not pertain to purpose of this study (n = 16,000) and/or represented heterogeneous disabilities in samples (n = 24). Based on the specified inclusion criteria, 37 papers were selected. Following more in-depth examination using the inclusion and exclusion criteria, 25 were excluded: 20 were duplicates and five did not include risk factors related to sleep disorders in their findings. A total of 12 papers were included in study sample. The selection process is shown in Fig. 1.

The study sample set included eight quantitative studies, three reviews, and one case study. Cross-sectional design was applied in four of quantitative studies, case-control in two, a retrospective chart review in one and one was a prospective cohort study. The majority of the studies were published in pediatric journals; three were focused in the field of neurology. Most studies presented a low level of evidence: five with level VI, three level V and three level IV. Two authors conducted studies in the United Kingdom, while the remainder occurred in Ireland, The Netherlands, India, United States of America, Italy, Brazil and Malaysia.

Eight studies assessed sleep including: frequency, types of sleep disorders, and their risk factors. Two studies evaluated sleep in