Sleep and sleep disorders in pediatrics

Essay submitted for partial fulfillment of Master degree in pediatrics

By

Heba Helal Hassan Ibrahem

M.B.B.Ch,

Supervisors

Shereen Mohamed Abd El Fatah

Professor of pediatrics

Faculty of Medicine

Ain Shams University

Eman Amin Abd El Aziz

Professor of pediatrics

Faculty of Medicine

Ain Shams University

Mohamed El Sayed Mowafi

Assistant professor of pediatrics

Faculty of Medicine

Ain Shams University

Faculty of Medicine

Ain Shams University

٢٠١٢

Contents

Title **Page**

List of Tables

List of Figures

List of Abbreviations

AASM	American Academy of Sleep Medicine
ADHD	Attention deficit/hyperactivity disorder
ANS	Autonomic nervous system
APA	American Psychiatric Association
ASD	Autism spectrum disorders
DSPS	Delayed sleep-phase syndrome
EDS	Excessive daytime somnolence
EEG	Electroencephalogram
EMG	Electromyography
EOG	Electro-oculography
GABA	Gamma aminobutyric acid
GAD	Generalized anxiety disorder
HP	Hypothalamic-pituitary-adrenal
IL-١, IL-٦	Interleukin -١،٦

ICSD	International Classification of Sleep Disorders
MDD	Major depressive disorder
NREM	Non-rapid eye-movement sleep
OCD	Obsessive compulsive disorder
OSA	Obstructive Sleep Apnea
PGO spikes	ponto-geniculo-occipital spikes
PLM	Periodic limb movement disorder
PSG	Polysmonography
PTSD	post-traumatic stress disorder
REM	Rapid eye-movement sleep
RBD	REM sleep behavior disorder
RLS	Restless legs syndrome
RMD	Rhythmic movement disorder
SAD	Separation anxiety disorder
SCN	Suprachiasmatic nuclei
SDB	Sleep-disordered breathing
SOC	Social phobia

SSRIs	Selective serotonin reuptake inhibitors
SWA	Slow wave activity
SWS	Slow-wave sleep
TNF	Tumor necrosis factor

Introduction

Sleep and rest can be satisfactorily explained as adaptive states,whose core function is energy conservation and behavioral regulation. It is characterized by a variety of physiologic, behavioral, and EEG changes and is necessary for restoration of cognitive, mood, and physiologic functions **(Carskadon and Dement, ٢٠٠٥).** The study of sleep should not only refer to the fact of sleeping well at night but also should include the examination of daytime functioning. The subjective report of the patient is of great importance in sleep alterations, **(Anders and Eiben, ١٩٩٧).** The average person spends approximately one third of his or her life sleeping. Yet health care professionals, including psychologists, know little about the diagnosis and treatment of sleep problems. This is in contrast to the level of education and training in the diagnosis and treatment of daytime problems, including physical and mental health disorders. There are multiple reasons why training in sleep and sleep disorders is beneficial for clinical psychologists. Sleep problems are highly prevalent, affecting approximately ٧٥٪ of adults **(National Sleep Foundation, ٢٠٠٥)** and ٢٥–٤٠٪ of children **(Owens, ٢٠٠٥).**

In clinical practice, sleep disorders are often only rarely addressed or treated. Despite the high prevalence of sleep

disorders in the population and primary care setting, several studies suggest that sleep complains are under addressed by physicians. Only one-third of patients with insomnia mention it to their physicians and only ٥٪ seek treatment **(Shochat et al., ١٩٩٩).**

Sleep problems are even more rarely addressed in the pediatric age population. Poor sleep and sleep disturbances are common in children. we operationalize poor sleep as short sleep duration and low sleep efficiency and sleep disturbances as parent-reported sleep disorders, eg, parasomnias, bedtime resistance, motor activity during sleep, sleep disordered breathing, daytime somnolence, and sleep hyperhydrosis. According to some estimates, ٢٠٪ to ٣٣٪ of children are affected by these sleep-related problems. For those with sleep problems, about half have persistent problem **(Fricke et al., ٢٠٠٧ and Smaldone et al., ٢٠٠٧)**

Sleep has long been identified as factor strongly associated with mental disorders.problem with sleep are a part of the diagnostic criteria for several mental disorders, including major depression, bipolar disorder, and generalized anxiety disorder, and play a key role in the regulation of physical functioning. In recent years, there has been increased interest in the relationship

between sleep abnormalities and mental disorders; there has also been increased interest in the relationship between sleep and the regulation of aggressive and impulsive behaviors in clinical and preclinical studies **(Smith et al., ٢٠٠٤).**

Stein and others find it particularly significant that children with sleep disturbances are often at a higher risk of further psychic, social, and medical problems. For this reason, they urge that increased attention be paid to possible sleep disorders during routine medical examinations, e.g., visits to the pediatrician or family physician **(Stein et al., ٢٠٠١).** Epidemiological and school-based studies demonstrate that excessive daytime fatigue is responsible for significant impairments in school performance and behavioral problems in about ١٠٪ of schoolchildren **(Chervin et al., ٢٠٠٠ and Owens et al., ٢٠٠٠).**

Persistent sleep disturbance during childhood has been associated with concurrent and long-term problems in academic performance, school absenteeism, poor impulse control, risk-taking behavior, injury and impaired social functioning **(McLaughlin & Witcher, ٢٠٠٨)**. Potential effects on physical health are also deleterious, including cardiovascular risks, compromised immune function and metabolic changes such as

insulin resistance, which can persist into adulthood in the absence of treatment **(Gozal & Kheirandish, ٢٠٠٨)**

Aim of the work

To provide a review on sleep and sleeping disordes as regards diagnosis and methods of management.

CHAPTER ONE

NORMAL HUMAN SLEEP

Basic Principles of Sleep Physiology

DEFINITION OF SLEEP

Sleep can be defined as a regular, recurrent, and easily reversible state that is characterized by relative quiescence and a great increase in the threshold of response to external stimuli relative to the waking state. Voulantry activity and sensory perception are abolished. It is an active physyiological process with clearly defined electrocorticographyical and behavioral changes, dependent on specific neurochemical activities of the brainstem and other brain areas extending from medulla to the posterior dienchephalon **(Kaplan & Sadock, ١٩٩٨).** It is not simply rest. However, the essential function or functions of sleep remain to be fully elucidated. Sleep is considered a time in which the mind and body rest and recuperate, but in actuality, sleep is a period of considerable neurologic and physiologic activity **(Zee & Turek, ١٩٩٩).**

It is an active process where in some brain regions show the same (or increased) activity as during wakefulness. Moreover,

there are several aspects of sleep including the continuity, timing, and patterning of different stages of sleep that are necessary for the restorative process to occur **(Roth et al, ١٩٩٤).** It is like physical activity and diet, serves an important role in the growth, maturation, and health of the child and adolescent **(Mindell et al., ١٩٩٩)**. Sufficient sleep is essential for the physical growth, emotional stability, and maintenance of cognitive function in adolescence **(Banks and Dinges, ٢٠٠٧).**

Sleep architecture:

Sleep architecture refers to the basic structural organization of normal sleep.It is characterized by a variety of physiologic, behavioral, and EEG changes and is necessary for restoration of cognitive, mood, and physiologic functions (**Parthasarathy et al.,**٢٠٠٤). There are two types of sleep, non-rapid eye-movement (NREM) sleep and rapid eye-movement (REM) sleep. NREM sleep is divided into stages ١, ٢, ٣, and ٤, representing a continuum of relative depth. Each has unique characteristics including variation in brain wave patterns, eye movements, and muscle tone **(Colten & Altevogt, ٢٠٠٧).** Over the course of a period of sleep, NREM and REM sleep alternate cyclically (Figure ١) **(Zepelin et al., ٢٠٠٥).** A sleep episode begins with a short period of NREM stage ١ progressing through stage ٢,

followed by stage ٣ and ٤ finally to REM. However, individuals do not remain in REM the remainder of the night but, rather, cycle between stages of NREM and REM throughout the night (Figure ١). NREM sleep constitutes about ٧٥ to ٨٠ percent of total time spent in sleep, and REM sleep constitutes the remaining ٢٠ to ٢٥ percent. The average length of the first NREM–REM sleep cycle is ٧٠ to ١٠٠ minutes. The second, and later, cycles are longer lasting approximately ٩٠ to ١٢٠ minutes **(Carskadon & Dement, ٢٠٠٥).** The function of alternations between these types of sleep is not yet understood, but irregular cycling and /or absent sleep stages are associated with sleep disorders **(Zepelin et al., ٢٠٠٥).** For example, instead of entering sleep through NREM, as is typical, individuals with narcolepsy enter sleep directly into REM sleep **(Carskadon & Rechtsechaffen, ٢٠٠٥).**

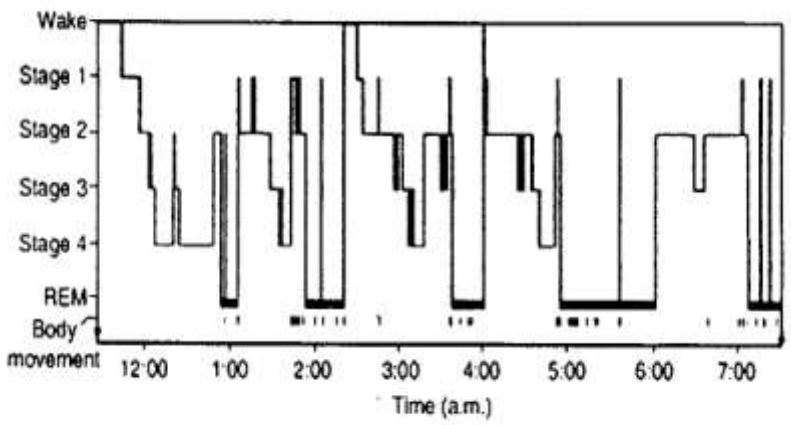

Figure (١): Progression of sleep states across a single night in young (Carskadon & Dement, ٢٠٠٥).

١-NREM Sleep

According to the classification of Rechtschaffen and Kales **(٢٠٠٣)** NREM sleep is subdivided into four stages: stages ١, ٢, ٣, and ٤. Stages ١ and ٢ are often considered "light sleep," whereas stages ٣ and ٤ are considered "deep sleep," and together are called SWS (Figure ٢). In the young adult, stages ١ and ٢ account for approximately ٤–٩٪ and ٤٥–٦٠٪ of total sleep time, respectively, while normal subjects spend between ١٠ and ٢٥٪ of their total sleep time in slow wave sleep (SWS). In the new scoring manual of the American Academy of Sleep Medicine **(AASM, ٢٠٠٥)**, a distinction between stage ٣ and stage ٤ sleep is no longer made and SWS is referred to as NREM٣ or N٣. **(Iber, ٢٠٠٧)**