



النوم واليقظة لدى الأطفال المصابين باضطراب نقص الانتباه وفرط الحركة

الآثار التي تترتب على التشخيص وعلى المعالجة
دراسة مراجعة أجريت لتحقيق متطلبات
الحصول على درجة الماجستير في الطب النفسي وطب المخ والأعصاب

مقدمة من:

آلاء صلاح السيد النجار

بإشراف:

الأستاذ الدكتور طارق أسعد عبده

أستاذ الطب النفسي

قسم الطب النفسي وطب المخ والأعصاب

كلية الطب- جامعة عين شمس

الأستاذ الدكتور حنان محمد عز الدين عزام

أستاذ مساعد الطب النفسي

قسم الطب النفسي وطب المخ والأعصاب

كلية الطب- جامعة عين شمس

الأستاذ الدكتور سهير حلمي الغنيمي

أستاذ مساعد الطب النفسي

قسم الطب النفسي وطب المخ والأعصاب

كلية الطب- جامعة عين شمس

قسم الطب النفسي وطب المخ والأعصاب

كلية الطب- جامعة عين شمس

2012



SLEEP AND ALERTNESS IN CHILDREN WITH ATTENTION DEFICIT/HYPERACTIVITY DISORDER

Implications for Diagnosis and Management
Review Submitted for the Partial Fulfillment of the
Master's Degree in Neuro-Psychiatry

By:

Alaa Salah Elsayed Elnajjar

Supervised By:

Prof. Tarek Asaad Abdo

Professor of Psychiatry

Department of Neuropsychiatry

Faculty of Medicine - Ain Shams University

Assistant Prof. Hanan M. Ezzeldin Azzam

Assistant Professor of Psychiatry

Department of Neuropsychiatry

Faculty of Medicine - Ain Shams University

Assistant Prof. Soheir Helmy El Ghonemy

Assistant Professor of Psychiatry

Department of Neuropsychiatry

Faculty of Medicine - Ain Shams University

**Faculty of Medicine
Ain Shams University**

2012

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



صدق الله العظيم

سورة البقرة: آية (٣٢)

ACKNOWLEDGEMENT

First of all, Thanks for God for His Blessings in all my life.

I want to thank my respectable supervisors. I am greatly honored to express my sincere appreciation to ***Professor Dr. Tarek Asaad Abdo*** Professor of Neuropsychiatry, and the head of Psychophysiology and Sleep Unit in the Institute of Psychiatry, Faculty of Medicine, Ain Shams University, for his knowledge and experience, his contribution to this work, his invaluable advice, abounding patience, support and guidance.

I am extremely grateful to my supervisor ***Professor Dr. Hanan Ezzeldin M. Azzam***, Assistant Professor of Neuropsychiatry, Faculty of Medicine, Ain Shams University, for her meticulous revision, tremendous assistance, continuous guidance, kindness and enthusiastic support.

I wish to express my deepest gratitude to ***Professor Dr. Soheir Helmy El Ghonemy***, Lecturer of Neuropsychiatry, Faculty of Medicine, Ain Shams University, for her continuous help, guidance, close supervision and advice, which helped this work to be possible.

Also, I have to announce my thankfulness to the hidden soldier behind me, and here saying thank you is

Acknowledgement

never enough, my kind dear father, for his love, kindness and guidance that helped me through this work. My loving supportive mother, No words can ever express my love for her. Without all her effort, help, love and care throughout this work, it wouldn't have come to existence. My caring husband, for his warm support and care that pushed me forward. To my sweet beloved daughter Jasmine, her love and smile helped me to stand the hard work. My sisters and brothers, for their love, support and care.

My thanks also go to all my Professors of Neuropsychiatry Department, Faculty of Medicine, Ain Shams University and for those who helped me in this study.

Last but not least, it is a pleasure and a privilege to acknowledge the support and encouragement of my colleagues.

LIST OF CONTENTS

	Page
1. Introduction.	1
2. Physiology of Sleep.	5
3. Relationship between Attention-deficit / hyperactivity disorder (ADHD) and sleep and alertness.	44
4. Sleep disorders in ADHD.	66
5. Management and Evaluation.	98
6. Discussion.	121
7. Conclusion.	136
8. Recommendations.	138
9. Summary.	143
10. References.	150
11. Arabic summary.	-

LIST OF ABBREVIATIONS

AASM	American academy of sleep medicine
ACTeRS	ADD-H comprehensive teachers rating scale
ACTH	Adrenocorticotrophic hormone
ADD	Attention-deficit disorder
ADHD	Attention-deficit hyperactivity disorder
AHI	Apnea hypopnea index
ASD	Autism Spectrum Disorders
b.i.d.	Twice a day
BF	Basal forebrain
CA	Confusional arousals
CBCL-P	Child behavior checklist-parent
CBCL-T	Child behavior checklist-teacher
CD	Conduct disorder
CHSQ	Children's sleep habits questionnaire
CNS	Central nervous system
COMT	Catechol-O-methyltransferase
CPAP	Continuous positive airway pressure

List of contents

CPRS	Connors parent rating scale
CSA	Central sleep apnea syndrome
CSF	Cerebrospinal fluid
CSQ-P	Child sleep questionnaire: parent version
CSR	Cheyne-Stokes respiration
CTRS	Connors teacher rating scale
DA	Dopamine
DEX	Dextroamphetamine
DICA-R	Diagnostic interview for children and adolescents-revised
DLMO	Dim light melatonin onset
DOA	Disorders of Partial Arousal
DSM	Diagnostic and statistical manual of mental disorders
DSPS	Delayed sleep phase syndrome
EDS	Excessive daytime sleepiness
EEG	Electroencephalogram
EMG	Electromyogram activity
EOG	Electro-oculogram
ER	Extended release

List of contents

FDA	U.S. Food and Drug Administration
GABA	Gama aminobutyric acid
Gal	Galanin
GHRH	Growth hormone-releasing hormone
HA	Histamine
hADHD	Hyperactive ADHD
iADHD	Inattentive ADHD
ICSD-2	International Classification of Sleep Disorders International Classification of Sleep Disorders
IED	Interictal discharges
IR	Immediate release
IRLSSG	International Restless Legs Syndrome Study Group
K-SADS	Schedule for affective disorders and schizophrenia for school-aged children
LC	Locus coeruleus
LD	Learning disorder
LDT	Laterodorsal tegmental nuclei
MET	Methionine
MPH	Methylphenidate

List of contents

MR	Mental retardation
MRI	Magnetic resonance imaging
MSLT	Multiple sleep latency test
NA	Noradrenaline
NO	Nitric oxide
NREM	Non rapid eye movement sleep
NT	Night terrors
ODD	Oppositional defiant disorder
OSA	Obstructive sleep apnea
PCPA	P-chlorophenylalanine
PDD	Pervasive developmental disorders
PET	Positron emission tomography
PFC	Prefrontal cortex
PGD	Prostaglandin
PGO	Pontine-geniculo-occipital
PLMS	Periodic limb movement in sleep
PPT	Pedunculopontine nuclei
PSG	Polysomnography
PSQ	Pediatric sleep questionnaire

List of contents

q.i.d.	Four times a day
O.d	Once a day
RAS	Reticular activating system
RDI	Respiratory disturbance index
REM	Rapid eye movement sleep
RET	Reticular nucleus of the thalamus
RLS	Restless legs syndrome
RLS/PLMS	Restless legs syndrome/periodic limb movements in sleep
RMD	Rhythmic Movement Disorder
ROL	REM onset latency
SBD	Sleep breathing disorder
SCN	Suprachiasmatic nucleus
SDB	Sleep-disordered breathing
SE	Sleep efficiency
SEM	Slow eye movements
SOL	Sleep onset latency
SP	Sleep percent
SSERS	Stimulant side effects rating scale
SSRI	Selective serotonin reuptake inhibitors

List of contents

SW	Sleepwalking
SWS	Slow wave sleep
t.i.d.	Three times a day
TCA	Tricyclic antidepressant
TMN	Tuberomammillary nucleus
TNF	Tumour necrosis factor
TOVA	Tests of Variable Attention
VAL	Valine
VLPO	Ventrolateral preoptic nucleus
WASO	Wake after sleep onset

LIST OF TABLES

Table	Page
1.1- EOG markers of alertness	8
1.2- Stages of sleep: electrophysiological criteria	16
1.3- The developmental Changes in Sleep and Sleep Cycle Organization from the Neonatal Period to Adulthood	18
3.1- (IRLSSG) revised RLS criteria.	71
4.1- Possible strategies to deal with sleep alterations caused by stimulants	118

LIST OF FIGURES

Figure	Page
1.1– Wakefulness with presence of alpha waves and REMs.	8
1.2– Stage N1 with mixed-frequency EEG and rolling eye movements	10
1.3– Stage N2 with K complex and sleep spindles.	11
1.4– Stage N3 with delta waves	12
1.5- Stage REM with rapid eye movements and saw tooth waves	13
1.6- The hypocretins (Orexin) neurons in the lateral hypothalamic area	23
1.7- The ascending arousal system	24
1.8- The projections from the VLPO to the main components of the ascending arousal system	25
1.9- Graphic depiction of the flip flop switch model of wakefulness and sleep systems.	34

Figure	Page
1.10- Circadian rhythms in body core temperature and sleep	38
2.1- Catecholamines influence on prefrontal cortex function	50
2.2- Tuning cortical pyramidal neurons in ADHD	51
3.1- Conceptual model of the multidirectional and multifactorial aspects pertaining to sleep and attention-deficit/hyperactivity disorder	68
3.2- A model by which sleep disruption or physiologic effects of sleep apnea could alter daytime behavior in children	89
4.1- An evaluation strategy for the child who presents with the most common sleep complaint reported in ADHD	119
4.2- Evaluation and management of pediatrics sleep problems	120