

Electro Physiological Changes in Sleep of Autistic Children in Outpatient Clinic

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ABSTRACT

Background: Sleep disturbances are common and agonizing problem in children with autistic disorder. **Objective:** to study both clinically and neurophysiologically, this problem in AD children. **Subjects and methods:** Patients were recruited from child Psychiatry Clinic Institute of Psychiatry Ain Shams University. They were 15 children with childhood autism and the study was controlled one. We examined both groups clinically and psychometrically using (CARS) and groups children's sleep habits questionnaire and neurophysiologically using polysomnography in sleep laboratory. **Results:** Polysomnography findings showed significant abnormalities in stage 1, stage 2 NREM sleep. There were prolonged while REM was decreased. Moreover an association was found between autistic disorder and a variant in the promoter region of serotonin transporter gene which leads to decreased protein expression. **Conclusion:** This significant information may help in the understanding in neurophysiology of AD and its management.

Key words: Sleep, Autism, Electrophysiological changes.

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INTRODUCTION

Autistic disorder (AD) in children is a severe syndrome characterized by marked abnormal development in social interactions and communication and restricted repertoire of activities and interests with stereotyped behavior patterns (DSM-IV)¹. Autistic disorder shows heterogeneity in onset, course, associated neurological deficits and severity².

Prevalence of AD is a matter of debate. It ranges from 0.7 per 10000 with a median of 4 to 5 per 10000 of the general population³. Etiology of AD is still obscure, there are a lot of neurological and biochemical theories of it but no strong evidence up till now. For

example left hemispheric dysfunction due to immaturity or genetic factor was postulated⁴. Also AD was believed to be caused by diverse conditions that affected the CNS. The biological basis of autism is supported by high rate of associated MR, increased incidence of epilepsy³. Another interesting hypothesis of AD is the immunological hypothesis⁴. It was proposed that in very young children an inherited deficiency of the immune systems may prevent the patient from adequately clearing an infective pathogen in timely and normal fashion, placing the children at a higher risk for the pathogen to interfere with the brain development and for trigger

an autoimmune response either of which resulting in the symptoms of autism.

Sleep disturbance in AD are very problematic for caregivers of these children. They may also give some information that help in the understanding of neurophysiology and etiology of this disorder. One of the best methods to study sleep for AD is polysomnography. That is why in our work preferred this way to study the neurophysiology of AD through this technique.

We here aimed at the detection both clinically and physiologically the sleep abnormalities of AD children. This may help in both understanding physiology of AD and also help in management of one of the problems that face caregivers of these children.

SUBJECTS AND METHODS

This work was done on 15 children with autistic disorder collected randomly from Out-Patient Clinic of Child Psychiatry, Institute of Psychiatry, Ain Shams University during 2004. Diagnosis was done by two senior psychiatrists. Age range of children was between 2 and 12 years old and all patients met the criteria of autistic disorder according to both DSM-IV and ICD-10. This group was considered the first group and the severity of autism was assessed by using Childhood Autism Rating Scale⁵ (CARS). Control group (group II) was selected to be matched for both age and gender from files in the bank of polysomnography of children in the Institute of Ain Shams Neuropsychiatry Unit (n=10).

Subjective sleep assessment was obtained through Arabic version of children's sleep habits questionnaire (SHQ)⁶.

Sleep was also objectively assessed by polysomnogram (PSG) performed at the sleep lab of the Institute of Psychiatry Ain Shams University. The child's mother attended to insure comfort to the child and put him to sleep. All medications except anti epileptics in some patients were stopped before the study. Sleep staging depending on recording EEG the electroculogram and electromyogram. EEG electrodes were applied according to the international 10-20 system of electoral placement. For this work four channels EEG (C4-01, C3-02, A1-C3, A1-C4) were used to record sleep EEG. Elctoroculogram was recorded using the right outer canthus (Roc) and left outer canthus (loc) electrodes with one of them one centimeter above and the other one centimeter below the outer canthus to record eye movements. Electro myogram (EMG) was recorded using two electrodes placed on and below the chin to monitor EMG which was recorded on a separate channel monitoring nasal airflow by a special sensor on a separate channel and using a pulse oximeter to monitor oxygen saturation changes. All PSG recording were scored manually according to the standard manual for staging normal sleep⁷. Parameters measured included sleep latency, sleep, efficiency percentage of different sleep stages (SWS and REM latencies, REM density, number of awakenings, apnea index and PLMS index. The control group (G2) formed of 10 healthy age and sex matched children from the information bank of the sleep laboratory were obtained. The data was collected and analyzed and statistical analysis was done to compare between both groups.

RESULTS

Autistic children showed clinically as evident in table (1) high incidence of epilepsy 46.7%, hyperactivity in more than of half of them. History of Perinatal complication was given nearly half of them. They did not show high prevalence of abnormal early development before 2 years or history of aggression or sleep injury.

Autistic children have high percentage of clinical sleep disturbance 93% showed mild borderline sleeplessness (inverted sleep rhythm). 73% showed mid sleep latency and 20 % showed severe sleep latency bed time resistance was present in all of them but mostly mild (60%) (table 2).

Table (3) showed high occurrence of different sleep disturbance in patients. Sleep

anxiety was present in 53.3% of them and night awaking was present in 40%. Nocturnal enuresis was seen in 20% of them and increased movements during sleep were in 26.7%. Sleep bruxism was seen in 20% of them while sleep breathing disorder was seen in 6.7% of them.

Polysomnography showed clear evidence of differences between autistic children and normal children (table 4). Sleep efficiency was poor significantly in autistic children. Stage 1 and stage 2 were significantly deteriorates in patients than in normal control. Similarly REM phase, arousal one, number of awakenings and periodic leg movements were significantly higher in autistic children than normal children.

Table 1: Main clinical features of patients

	Present		Absent	
	No	%	No	%
Epilepsy	7	46.7	8	53.3
Hyperactivity	8	53.3	7	46.7
Perinatal complications	7	46.7	8	53.3
Normal early development	6	40	9	60
Aggression	3	20	12	80
Self injury	6	40	9	60

Table 2: The severity of some sleep parameters in the patients

	Mild %	Moderate %	Severe %
Bed time resistance	60	26.7	13.3
Sleep latency	73.3	6.7	20
Day time sleepiness	93.3	6.7	0

Table 3: Occurrence of sleep disturbances in patients

	Present		Absent	
	No	%	No	%
Adequate sleep duration	14	93.3	1	6.7
Sleep anxiety	8	53.3	7	46.7
Night awakening	6	40	9	60
Breathing disorders	1	6.7	14	93.3
Nocturnal enuresis	3	20	9	80
Increased movements	4	26.7	11	66.3
Sleep bruxism	3	20	12	80

Table 4: Polysomnography findings in patient and control groups

Sleep parameter	Cases		Control		T	P-value	Significance
	Mean	SD	Mean	SD			
Sleep efficiency. %	85.83	4.93	92.66	2.17	4.09	< 0.01	HS
Stage 1%	2.91	0.58	2.03	0.23	4.50	< 0.01	HS
Stage 2%	52.24	1.07	51.20	0.83	2.59	< 0.05	S
Stage 3%	11.36	0.86	11.31	0.34	0.17	> 0.05	NS
Stage 4%	11.80	0.73	11.96	0.40	0.62	> 0.05	NS
SWS %	22.96	1.23	22.88	0.51	0.19	> 0.05	NS
REM %	21.94	1.15	23.89	1.22	4.01	< 0.01	HS
SWSL	27.86	2.97	29.20	1.22	1033	> 0.05	NS
REML	66.46	5.13	67.10	4.01	0.32	> 0.05	NS
REM D	17.48	0.79	17.90	0.44	1.48	> 0.05	NS
Arousal I	0.86	0.39	0.47	0.25	2.73	> 0.05	HS
Number of awakenings	1.60	1.12	0.10	.316	4.09	< 0.01	HS
Apnea index	8.66	0.22	0.00	0.00	1.21	> 0.05	NS
Obstructive apnea	6.66	0.17	0.00	0.00	1.16	> 0.05	NS
Mixed apnea	1.33	5.16	0.00	0.00	0.81	> 0.05	NS
Apnea hypoxia index	5.33	0.20	0.00	0.00	0.81	> 0.05	NS
PLMS I	0.92	0.48	0.41	0.24	3.05	< 0.05	S

DISCUSSION

Few studies have investigated sleep disorders in AD and most of them were based on parental reports⁸⁻⁹. The imprecision of sleep questionnaire answered by the parents may be because parents can not always know what happens to the child during sleep especially if he/she sleeps in another room. To overcome the impression, objective sleep studies were performed using polysomnography but they are few in number¹⁰.

In our study we combined both clinical questionnaire and physiological methods. This allows evaluation of the child's sleep habits at home over a relatively long time which can not be assessed by the polysomnography alone. It is also useful for evaluating events that do not occur every day as nocturnal enuresis. This was followed by objective sleep assessment by polysomnography. This allowed studying

sleep architecture and verifying the data obtained from the questionnaire.

Our findings in this study included high frequency of epilepsy in AD children (47.3%) and this may affected their sleep pattern. This finding is higher than previous studies¹¹⁻¹² however our findings in sleep EEG are not attributed to epilepsy because they all were well controlled on their antiepileptic drugs.

As regards clinical sleep abnormalities much of the previous studies reported a variety of them in AD children especially in the initiation of sleep shortened sleep time, sleep latencies and frequent awakening¹⁰ and results were nearly similar to our results.

Bruxism is found to be around 5% to 20% of total population. In autistic children it was 25% which is near to our results (20%). Explanation of this phenomenon may be

related to increased dopamine (D2) receptors in striatum of brains of these children¹³.

Polysomnography findings in our study showed significant abnormalities in stage 1, stage 2 NREM sleep. There were prolonged while REM was decreased. These changes in sleep architecture were not reported frequently in children with AD¹⁴⁻¹⁵. However these findings in our study could be explained by serotonin disturbances that were commonly described in children with AD with elevated serotonin in up to one third of patients³. Moreover an association was found between autistic disorder and a variant in the promoter region of serotonin transporter gene which leads to decreased protein expression⁴. Further studies are recommended to determine the relation between sleep disturbances in AD and serotonin in the brains of these patients. SPECT may be a useful aid in these studies in combination with polysomnography.

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