Short Communication

BIOMEDICAL Journal of Scientific & Technical Research

ISSN: 2574 -1241

DOI: 10.26717/BJSTR.2020.24.004055

Autism-Spectrum Quotient in Teenage Patients Suffering from Difficulty Getting Up Due to Excessive Morning Sleepiness

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ARTICLE INFO

Received: December 20, 2019

Published: January 09, 2020

Citation: Reiko Hori, Tetsuro Hoshino, Maiko Yamaguchi, Yoko Haseda, Ayako Urabe, et al. Autism-Spectrum Quotient in Teenage Patients Suffering from Difficulty Getting Up Due to Excessive Morning Sleepiness. Biomed J Sci & Tech Res 24(3)-2020. BJSTR. MS.ID.004055.

Keywords: School absenteeism; difficulty getting up; excessive morning sleepiness; Autism-spectrum Quotient

ABSTRACT

Background: An increasing number of teenagers are visiting our sleep clinic because of school non-attendance caused by difficulty getting up or excessive morning sleepiness. Medical interviews and examinations sometimes reveal that these patients have developmental disorders.

Objective: To examine the prevalence of autistic traits in teenage patients with difficulty getting up due to excessive morning sleepiness.

Method: A total of 76 patients with difficulty getting up due to excessive morning sleepiness underwent nocturnal polysomnography and multiple sleep latency testing were enrolled in this study. The prevalence of autistic traits among patients were evaluated using Autism-spectrum Quotient (AQ).

Results: Seven patients (9.2%) had high AQ scores.

Conclusion: It is important to estimate autistic traits using AQ in teenagers with difficulty getting up.

Abbreviations: ASD: Autistic Spectrum Disorders; AQ: Autism-Spectrum Quotient; BIISS: Behaviorally Induced Insufficient Sleep Syndrome; CRSWD: Circadian Rhythm Sleep-Wake Disorder; ESS: Epworth Sleepiness Scale; IHS: Idiopathic Hypersomnia; PSQI: Pittsburgh Sleep Quality Index; SDS: Self-Rating Depression Scale; PSG: Polysomnography; MSLT: Multiple Sleep Latency Test

Introduction

School attendance is essential for both academic and social-emotional development. However, increasing numbers of teenagers visit our sleep clinic because of school absenteeism caused by difficulty getting up or excessive morning sleepiness. Medical interviews and examinations sometimes reveal that these patients have developmental disorders. Although several known factors can affect school absenteeism, such as prolonged sleep time and lack of synchronicity between sleep-wake rhythms and the local time, the prevalence of autistic traits in patients with such difficulties is unclear [1]. Thus, the main objective of this cross-sectional study was to examine the prevalence of autistic traits in teenage patients with difficulty getting up due to excessive morning sleepiness.

Material and Methods

The study's protocol adhered to the tenets of the 1964 Declaration of Helsinki and was received ethical approval from

the Institutional Review Board (IRB) of Aichi Medical University (approval number: 2017-H337). We assessed 76 teenage patients who presented in our sleep clinic department with difficulty getting up due to excessive morning sleepiness from December 2015 to September 2017. Upon patients' first visit to our department, we provide sleep hygiene education to help them understand the positive effect of sufficient sleep time. All patients in the study were encouraged to keep a sleep diary record of daily into-bed time, onset of sleep, wake-up, and getting up. Patients with insufficient sleep diary data or a diagnosis of bipolar disorder, major depressive disorder, or schizophrenia spectrum disorder were excluded from the analysis.

Questionnaires

All patients completed five questionnaires before undergoing a diagnostic sleep study. The Epworth Sleepiness Scale (ESS) measured subjective daytime sleepiness [2]. The Pittsburgh Sleep Quality Index (PSQI) measured sleep quality over a 1-month time interval [3]. The Self-rating Depression Scale (SDS) measured depressive symptoms during the past several days [4]. Finally, the Autism-spectrum Quotient (AQ) measured autistic traits [5]. An AQ score of 33 or more was considered a high AQ score.

Diagnostic Sleep Study

Overnight Polysomnography (PSG) was performed using an Alice 6 System (Philips Respironics, Tokyo, Japan). Apnea, hypopnea, and other PSG parameters were scored manually by a sleep technologist according to the 2007 AASM Manual for the Scoring of Sleep and Associated Events, version 2.1 [6]. Patients also underwent a five-nap Multiple Sleep Latency Test (MSLT) on the day of the PSG, according to standard protocol [7]. Based on the International Classification of Sleep Disorders – Third Edition [8], patients were diagnosed with narcolepsy, Idiopathic Hypersomnia (IHS), Circadian Rhythm Sleep-Wake Disorder (CRSWD), and Behaviorally Induced Insufficient Sleep Syndrome (BIISS). A sleep duration of more than 10 hours recorded in patients' sleep diary was considered long sleep.

Statistical Analysis

Patient characteristics were compared pairwise across the groups using a one-way ANOVA for normally distributed continuous data, a Kruskal-Wallis test for non-normally distributed continuous data, and Fisher's exact test for categorical data. To compare the patients' characteristics across the diagnostic categories, a Tukey-Kramer test was used for normally distributed data and a Steel-Dwass test was used for non-normally distributed data. The level of statistical significance was set at 5% ($p < 0.05$). All analyses were performed using SAS 9.4 (SAS Institute Inc., Cary, NC, USA).

Results

Of the 76 patients, 15 were classified as long sleepers, 27 has having CRSWD, 17 as having IHS, 8 as having narcolepsy, 5 as having BIISS, and 4 as recurrent hypersomnia that did not fulfill the diagnostic criteria for Kline-Levin syndrome. Seven patients (9.2%) had high AQ scores. Of these, two were long sleepers, two had CRSWD, and three had recurrent hypersomnia (Table 1).

Table 1: Prevalence of autistic traits in teenage patients with difficulty getting up or excessive morning sleepiness.

	Total (*n*=76)	Long sleep (*n*=15)	CRSWD (*n*=27)	IHS (*n*=17)	Narcolepsy (*n*=8)	BIISS (*n*=5)	Recurrent hypersomnia (*n*=4)	p
Male, *n* (%)	38 (50.0)	9 (60.0)	13 (48.2)	5 (29.4)	5 (62.5)	4 (80.0)	2 (50.0)	0.34
Age (years)	15.0 (14.0, 17.0)	15.0 (13.0, 15.0)	14.0 (13.0, 16.0)	16.0 (14.0, 17.0)	15.5 (14.5, 17.5)	18.0 (17.0, 19.0)	15.5 (15.0, 17.0)	0.04
BMI (kg/m^2)	19.1 (17.5, 20.9)	19.2 (17.6, 22.9)	19.0 (17.0, 20.4)	18.8 (17.9, 20.8)	20.3 (19.1, 21.1)	20.9 (19.0, 21.0)	19.6 (18.9, 20.4)	0.53
AQ score	22.8 ± 6.4	23.0 ± 8.3	22.7 ± 6.0	22.2 ± 5.7	21.5 ± 2.4	22.8 ± 4.6	28.0 ± 11.4	0.69
High AQ score, *n* (%)	7 (9.2)	2 (13.3)	2 (7.4)	0 (0)	0 (0)	0 (0)	3 (75.0)	<0.01
ESS	10.9 (5.7, 14.9)	8.0 (3.4, 12.6)	6.9 (1.1, 13.7)*,†	14.9 (10.3, 14.9)*	16.1 (12.6, 19.4)†	11.4 (11.4, 13.7)	13.7 (9.1, 17.1)	<0.01
PSQI	7.0 (5.0, 10.0)	6.0 (4.0, 10.0)	8.0 (6.0, 11.0)	7.0 (6.0, 10.0)	5.5 (3.5, 6.5)	7.0 (4.0, 8.0)	4.0 (3.0, 9.0)	0.1
SDS	45.6 ± 9.0	45.7 ± 8.5	47.2 ± 10.0	46.2 ± 9.1	38.3 ± 4.8	46.0 ± 10.3	46.0 ± 1.2	0.28
AHI (events/hr)	1.3 (0.5, 2.5)	1.7 (0.7, 2.5)	0.8 (0.2, 2.0)	2.0 (0.7, 3.7)	1.2 (0.6, 3.6)	2.0 (0.9, 2.8)	0.6 (0.3, 1.3)	0.21
MSLT mean sleep latency (min)	9.3 (5.0, 13.8)	12.2 (10.7, 14.7)	10.6 (6.8, 16.4)	4.9 (2.5, 5.8)	2.4 (1.5, 3.9)	13.6 (10.7, 14.2)	12.6 (7.5, 17.1)	< 0.01
MSLT number of SOREMPs	0 (0, 1.0)	0 (0, 1.0)	0 (0, 1.0)	0 (0, 1.0)	2.5 (2.0, 4.0)	0 (0, 1.0)	0 (0, 0)	< 0.01

Note: Mean ± SD are shown for normally distributed variables; median (lower quartile, upper quartile) are shown for non-normally distributed variables. AQ: Autism-spectrum Quotient, BIISS: behaviorally induced insufficient sleep syndrome; BMI: body mass index; CRSWD: circadian rhythm sleep-wake disorders; ESS: Epworth Sleepiness Scale, IHS: idiopathic hypersomnia; PSQI:

Pittsburgh Sleep Quality Index, SDS: Self-rating Depression Scale, AHI; Apnea-Hypopnea Index, MSLT: multiple sleep latency test, SOREMP: sleep-onset REM sleep period.

* $p < 0.05$, CRSWD vs. IHS. † $p < 0.05$, CRSWD vs. Narcolepsy.

Discussion

This is the first study to report the prevalence of autistic traits evaluated by AQ scores in teenage patients with difficulty getting up or excessive morning sleepiness. Kawamura et al. reported a 1.81% prevalence of pervasive developmental disorders among 12,589 children in Japan [9]. Moreover, the 2014 National Health Interview Survey reported an estimated 2.24% prevalence of ASD among children aged 3-17 years [10]. Our results indicate that it is important to estimate autistic traits using AQ in teenagers with difficulty getting up.

This study has several limitations. First, because there were no control subjects, no conclusions can be made regarding whether people with sleep-wake disorders have more autistic traits than those without sleep-wake disorders. Second, selection bias may have been introduced by the fact this study was conducted in a single facility. Finally, due to the retrospective nature of the study, the effects of unknown confounding factors could not be excluded. Future studies should consider the effects of gaming disorder in addition to these factors.

Declaration of Interest

The authors declare no potential conflicts of interest.

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ISSN: 2574-1241

DOI: 10.26717/BJSTR.2020.24.004055

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