Alterations in the sleep pattern in patients with Attention Deficit Hyperactivity Disorder during confinement due to the COVID-19 pandemic

Sleep disorders and COVID-19

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Abstract:

Objective: To compare the frequency of sleep disorders (SD) in subjects with attention deficit hyperactivity disorder (ADHD) and a control group, during confinement due to the COVID-19 pandemic.

Method: We studied 30 children with ADHD with a mean age of 8.2 years and a control group with 40 subjects with a mean age of 8.6 years. We used the Pediatric Sleep Questionnaire (PSQ) to evaluate the SD. The questionnaire was applied to the parents of the study subjects, through video calls scheduled during the months of August, September and October. Subjects with ADHD had previously been diagnosed in the Neuroscience Laboratory of the National Rehabilitation Institute, and they also regularly attended Cognitive Behavioral Therapy (CBT) for the control of inattention, hyperactivity and impulsivity characteristic of ADHD. Ethical aspects: His parents were contacted, the objective of the research was explained to them and their participation was requested under informed consent in accordance with the ethical standards in force of the Secretary of Health, Mexico.

Results: We observed a higher frequency of SD in children with ADHD compared to controls. In the control group, the same frequency of excessive daytime sleepiness and decreased the total amount of sleep was observed as the subjects with ADHD. We observed significant correlation values between the frequency decrease in the total amount of sleep, inadequate sleep hygiene, restless legs syndrome and periodic limb movement disorder in children with combined ADHD. Excessive daytime sleepiness, inadequate sleep hygiene in innate ADHD subjects, excessive daytime sleepiness, Periodic limb movement disorder in hyperactive ADHD subjects, and decreased total amount of sleep and excessive daytime sleepiness in the Control group.

Conclusions: The results suggest that during confinement by the COVID 19 Pandemic, subjects with ADHD present sleep problems, the most relevant being diminution of the total amount of sleep, inadequate sleep hygiene, restless legs syndrome, periodic movement disorder of limbs, excessive daytime sleepiness, inadequate sleep hygiene, periodic limb movement disorder. The subjects of the Control group presented decreased the total amount of sleep and excessive daytime sleepiness, which has a significant impact on the functioning and quality of Life of a child.

Keywords— ***ADHD, COVID19 pandemic, Sleep disorders, school children***

Introduction

The Pandemic generated by COVID-19, forced the governments of all the countries of the world to enter quarantine, the coexistence between the families changed radically modifying the daily coexistence between the members of the family. The child population in general was affected in their daily activity and important changes were observed in their behavior, sleep patterns, anxiety, depression, aggressiveness, etc. [1].

Attention deficit hyperactivity disorder (ADHD) is a neurodevelopmental disorder of a neurobiological nature originating in childhood and affecting throughout life, characterized by the presence of three typical symptoms: attention deficit, impulsivity, motor hyperactivity and / or vowel. (DSMV) [2].

There are few studies on the validity, prognosis and other measures of ADHD in the preschool population, but the importance of early detection is paramount to avoid the negative consequences and comorbidity of this disorder [3, 4].

Generally, children diagnosed with ADHD present comorbidity with Oppositional Defiant Disorder, Conduct Disorder, Conduct Disorder, Sleep Disorders, etc. Among the most frequent comorbidity in ADHD are: anxiety, Gilles de la Tourette syndrome, depression, oppositional defiant disorder, etc., but it can also be frequently associated with sleep disorders [5].

According to a study by Craig et al. 2017 [6] reported that regarding the nature of sleep disorders (SD), the most frequent was hypersomnolence (42.6%), followed by insomnia (29.7%), the syndrome of periodic movements of the legs (26%) and various respiratory disorders (24.8%). 18% of parents reported variability in disorders.

Some studies indicate that 30% of children and 60-80% of adults with ADHD have symptoms of SD such as daytime sleepiness, insomnia, late sleep phase syndrome, fractured sleep, RLS, and sleep-disordered breathing (Apneas Sleep) [7]. The variety and diversity of findings from different researchers have posed challenges in establishing whether sleep disorders are intrinsic to ADHD or whether they occur due to comorbidities derived from sleep disturbances. As a result, understanding of the nature of the relationship between sleep disturbances / disorders and ADHD remains unclear [5].

Cortese and Cols (2009) [8], found in a meta-analysis of ADHD and sleep disorders in children, (between 1987 and 2008), that children with ADHD have more difficulties falling asleep and more nocturnal awakenings than children normal. This problem causes a fragmentation of the sleep architecture, poor efficiency, respiratory disorders during sleep and because of poor sleep, they have excessive daytime sleepiness.

On the other hand, the relationship between neurodevelopmental disorders and sleep problems is complex and generally bidirectional: sleep problems can exacerbate the symptoms of these disorders and also be their cause. For example, children with ADHD, having difficulty falling asleep and fragmenting its architecture, generates difficulties in the ability to concentrate during the day [9].

During confinement due to the COVID19 pandemic, children with attention deficit and hyperactivity disorder are more vulnerable to suffering from sleep disorders. More marked alterations have been reported in their behavior, in emotional factors, anxiety, depression, sleep disturbances, etc. Confinement, social distancing, frequent hand washing, and the use of mouth covers showed an increase in the behavioral problems presented by patients with ADHD [10].

Confinement due to COVID 19 is a challenge for all children, adolescents and even more so for those with ADHD, so the objective of this work was to address the effects of confinement due to the COVID 19 Pandemic on sleep patterns, specifically in the children with Attention Deficit Hyperactivity Disorder.

MATERIALS AND METHODS:

Study design:

Seventy boys and girls from 7 to 12 years of chronological age (belonging to public elementary education schools in México City, México) were evaluated. Previously, they were diagnosed with Attention Deficit Hyperactivity Disorder through neurological, Paidopsychiatry, psychological and neuropsychological evaluation, at the National Institute of Rehabilitation LGII, México. The children who entered the protocol attended the Neuroscience Laboratory of the National Rehabilitation Institute to receive drug treatment and Cognitive Behavioral Psychological Therapy for behavioral control related to the specific characteristics of ADHD, before confinement due to the pandemic.

During the months of August, September and October 2020, the subjects with a diagnosis of ADHD and subjects with similar characteristics in age and sex without ADHD were located to form the control group, the parents or legal guardians were informed of the scope of the investigation, its purposes and possible benefits for their children, those who agreed proceeded to answer the Pediatric Sleep Questionnaire through scheduled video calls.

Procedures

To assess sleep disturbances during confinement due to COVID 19 in children with ADHD and the control group, the version of the Pediatric Sleep Questionnaire (PSQ) was used. The questionnaire has been validated in Spanish-speaking children and data validation has been published [11].

The questionnaire has high sensitivity and specificity to detect Sleep Disorders in children. The questionnaire is divided into two sections. The first looks for abnormalities in nighttime sleep behavior or sleep time (section A), the second looks for alterations in daytime behavior, including excessive sleepiness or other problems (section B). The questionnaire consists of 76 non-specific (dichotomous) items included "Do you think …… (Child's name) has trouble sleeping?" The answers were "yes", "no" or "don't know" and were evaluated by a clinical investigator in sleep disorders. The SD screening results were classified according to the International Classification of Sleep Disorders [12].

The questionnaire was administered through a structured interview by the main researcher, through video calls, which were scheduled according to the availability of the child and her parents. Likewise, we worked with the children and their parents using cognitive behavioral therapy and Neuropsychology exercises, the results will be reported in a subsequent work.

Statistics Analysis

The measures of central tendency and dispersion were calculated for the quantitative variables. Percentages were calculated for qualitative measures. The inferential analysis was carried out by calculating the Sperman Correlation Coefficient test-retest, Analysis of variance (ANOVA) uni- and multivariate, with Tukey's post-hoc determination. Statistical analysis was performed with a significance level of p = 0.05. The statistical package SPPS version 17 was used

Ethical considerations

All the participants (parents and their children) were fully explained the purpose of applying this questionnaire for the study of sleep disorders in patients with ADHD, as well as the advantages that it will give in the future follow-up of this disorder. Those who accepted signed an informed consent. This study is an investigation with minimal risk, according to the Regulations of the General Health Law (Second Title, Chapter I, art. 17). It was carried out in accordance with the provisions of the Nuremberg Code, the Declaration of Helsinki of the World Medical Association in the conduct of medical research on human beings, revised in Tokyo in 2000, and the Regulations of the General Law on Health Research for Health, Official Mexican Standard NOM-O12-SSA3-2012.

Results

A population of 70 subjects was studied, 30 subjects with ADHD and 40 subjects formed the control group, and the population by sex was distributed as follows: 67% belonging to the male sex and 23% to the female sex (Table 1).

Table 1. Distribution of the population by Sex

Variable	*Distribution*	
Sex	*No.*	*%*
Male	47	67
Female	23	33
Total	70	100

By clinical subtype, it showed a higher proportion of ADHD-C, and a lower percentage of ADHD-I (Table 2).

Table 2. Distribution of the population by clinical subtype.

Clinical Subtype	*No.*	*%*
Combined	16	56
Inattentive	5	18
Hip-Imp	9	26
Without ADD	40	45
Total	70	100

In relation to Sleep Disorders that were evaluated with the Pediatric Sleep Questionnaire [13]. The following results were obtained: Decrease in the total amount of sleep, (F = 7.6), gl 3.57 p = 0.05), in Periodic Limb Movement Disorder (F = 6.2), gl 0.46 p = 0.05). Tukey's post hoc analysis showed differences between the ADHD-C group and the Control group.

Likewise, significant differences were observed in: Excessive daytime sleepiness, (F = 5.2 gl 0.58 p= 0.01) Tukey's post-hoc analysis showed differences between the ADD-I group and the Control group. In The item Periodic Limb Movement Disorder (F = 6.0), gl 0.46 p = 0.05). Tukey's post-hoc analysis showed differences between the ADHD-HI group and the Control group (Table 3).

Inatento, ADHD-H Attention Deficit Hyperactivity Disorder Type Hyperactive Impulsive * p = 0.05

Table 3. Frequency of Sleep Disorders and in Children with Attention Deficit Hyperactivity Disorder and Control Group.

	*Control**		*ADHD-C*		*ADHD-I*		*ADHD-HI*			
Sleep Disorders	***x***	***δ***	***x***	***δ***	***x***	***δ***	***x***	***δ***	***F***	***p***
Increase in nocturnal awakenings	*4.3*	*3.6*	*7.8*	*2.7*	*7.6*	*3.0*	*8.3*	*2.7*	*6.1*	*0.58*
Decreased total amount of sleep	*6.5*	*2.8*	*14.4*	*2.3*	*15.9*	*1.7*	*14.5*	*2.1*	*7.6*	*0.41**
Periodic limb movement syndrome	*4.9*	*3.0*	*9.9*	*2.8*	*10.7*	*3.0*	*10.0*	*2.08*	*5.8**	*0.58**
Excessive daytime sleepiness	*3.2*	*2.6*	*13.7*	*1.3*	*13.4*	*1.6*	*13.7*	*1.3*	*5.2*	*0.52*
Inadequate sleep hygiene	*4.6*	*0.9*	*13.5*	*1.5*	*12.7*	*1.04*	*13.5*	*1.5*	*6.2**	*0.45**
Restless Leg Syndrome	*5.0*	*0.9*	*12.4*	*1.7*	*12.2*	*1.7*	*12.4*	*1.7*	*5.9*	*0.05*
Periodic limb movement disorder	*2.4*	*2.2*	*8.9*	*2.3*	*8.5*	*3.1*	*9.0*	*2.2*	*6.0*	*0.05*

ADHD-C. Attention Deficit Hyperactivity Disorder Combined Type, ADHD-I Attention Deficit Hyperactivity Disorder Type inattention, ADHD-H Attention Deficit Hyperactivity Disorder Type Hyperactive Impulsive * p = 0.05.

We observed significant correlation values between the frequency of decrease in the total amount of sleep (0.87), inadequate sleep hygiene (0.67), restless legs syndrome (0.82), and periodic limb movement disorder (0.68) in children with ADHD Combined. Excessive daytime sleepiness (0.69), inadequate sleep hygiene (0.64), in children with innate ADHD. Excessive daytime sleepiness (0.78), periodic limb movement disorder (0.75), and decreased total amount of sleep (0.78) in ADHD Hyperactive (Table 4).

Table 4. Correlation between the frequency of sleep disorders and the type of attention deficit hyperactivity disorder and control group

Sleep Disorders	***Clinical Subtype***		
	ADHD-C	***ADHD-I***	***ADHD-HI***
Decrease in the total amount of sleep	0.87*		
Excessive daytime sleepiness		0.69*	0.78*
Inadequate sleep hygiene	0.67*	0.64*	
Restless Leg Syndrome	0.82*		
Periodic limb movement disorder	0.68*		0.75*

ADHD-C. Attention Deficit Hyperactivity Disorder Combined Type, ADHD-I Attention Deficit Hyperactivity Disorder Type

Discussion

In this study, we found an increase in the frequency of Sleep Disorders in children with ADHD when compared to the control group of healthy children. In addition, we found significant correlations between the subtypes of ADHD, the children in the Control Group presented Decreased total amount of sleep and Excessive daytime sleepiness.

Comparison with other studies

The current COVID-19 pandemic and lockdown threatens to exacerbate symptoms in children and youth with a prior psychiatric disorder. This occurs within a family dynamic affected by an economic and social crisis. Although there is no exact evidence of the effects of the current pandemic, children and adolescents with psychiatric disorders are a vulnerable population that requires surveillance and interventions by specialized personnel. Current barriers and risks lead to pandemic care ideally being delivered through telepsychiatry [14].

In a study by Bobo et al. 2020 [15] between days 20 and 30 of the confinement, 538 parents responded to the survey of 533 responses in the final analysis. The vast majority of the respondents

were women (95%) with children whose mean age was 10.5 years. Since the confinement, 34.71% of the children experienced a worsening of well-being, 34.33% did not show significant changes and 30.96% responded better according to their parents. The thematic analysis showed that improving their children's anxiety was one of the main issues addressed by parents. However, some parents reported a worsening of their children's general well-being, and this manifested as oppositional / defiant attitudes and emotional outbursts. Parents also cited sleep problems and anxiety in this context, which is consistent with our results.

In a study by Chevence et al. 2020 [16], mentions that the Health system is now in urgent need of reorganization and must also prepare in the coming days and weeks to face an epidemic of emotional disorders due to the containment of the general population.

On the other hand, in a study carried out by Mengin et al; 2020 [17], it was observed that not only children were seen with mental health problems, but also adults showed an emotional imbalance caused by the effect of the pandemic, their results report between 11 and 73.4% of workers Health workers, including mainly doctors, nurses, and support staff, reported symptoms of post-traumatic stress disorder during flare-ups, with symptoms lasting a long time in 10-40%. Depressive symptoms are reported in 27.5-50.7%, insomnia symptoms in 34-36.1% and severe anxiety symptoms in 45%. General psychiatric symptoms during outbreaks range from 17.3% to 75.3%; High levels of work-related stress is reported in 18.1 to 80.1%.

Based on these studies and taking into account the confinement situation derived from the COVID-19 pandemic. In our research, we decided to analyze the personal and family environment of children with ADHD, evaluating the mental disorders derived from this isolation together with the pre-existing psychiatric problems. Therefore, it was decided to adopt the video calling strategy to carry out an evaluation and remote support.

We found that the current COVID-19 pandemic and confinement are a psychosocial adversity that threatens the stability of the family. Such a stressor can cause exacerbation of the symptoms of a previous mental disorder. Children and adolescents with psychiatric disorders are a vulnerable population that requires specialized care. Telepsychiatry becomes a modality with multiple advantages [18].

The European Group on Guidelines for ADHD published a guide for the treatment of these patients during the pandemic. Recommends that families use behavioral parenting strategies to enhance parenting and reduce oppositional, challenging, and disruptive behaviors [19].

It is also recommended to go to the online self-help versions of some evidence-based treatments, being careful with the use of untested mobile applications. Those who receive other non-pharmacological therapies should be encouraged to continue practicing exercises that can be transferred to new activities [20].

Studies carried out in previous epidemics as well as in the current pandemic, show a wide range of psychosocial consequences and multiple psychological symptoms, among which the alterations in the sleep pattern stand out, consistently in the publications it has been registered that close to one a third of the people who have experienced social isolation present insomnia, this being an important predictor for the development of mental disturbances with great compromises in functionality such as anxiety disorders, depression and post-traumatic stress [21].

The results of various studies have shown that negative emotions (such as; anxiety, depression and indignation) and sensitivity to social risks increased, while scores for positive emotions (for example, Oxford happiness) and satisfaction with life decreased. Most of the people experienced a greater concern for their family and their health than for leisure and leisure activities as well as communication with friends. The results contribute to the knowledge gaps of individual short-term changes in psychological conditions after the outbreak according to Sijia Li et al. 2020 [22], This approach is consistent with the results we obtained in the present work.

In a study prior to the pandemic, our working group reported an increase in the frequency of Sleep Disorders in children with ADHD when compared with the Control group healthy children, we did not found a higher frequency of SD in children with ADHD. However, we found correlations between the different types of ADHD, SD and executive functions [23].

Study limitations

Our study has some limitations. It is necessary to study a larger population to obtain more robust conclusions. Long-term prospective follow-up would strengthen our results.

Conclusions

According to our data, there is an increase in the frequency of SD in children with ADHD when these were compared with the control group (healthy children). The children in the control group also presented SD during the contingency and we also found significant correlations between the subtypes of ADHD and SD.

Therefore, it is recommended, derived from sleep disturbances in children during confinement due to COVID 19, that parents and teachers should try to monitor their children and / or students, as a priority group because they present a higher risk

level. Observe the changes in behavior that they have presented during confinement due to the pandemic, it should also be monitored that they fulfill their tasks and participate online

It is also important that children with ADHD continue with cognitive behavioral therapy through video calls and if necessary, that they proceed with their pharmacological treatment assisted by their Paidopsychiatry.

Post-COVID-19 plans must take into account the likely increase in mental illness to come, particularly among at-risk populations.

Some characteristics of the child such as disobedience, impulsivity and fluctuations in her behavior affect the emotional well-being of the family.

We observe that in general, families need timely and adequate guidance that allows them to improve their relationship with their children who suffer from ADHD and thus achieve a better quality of life.

Conflict of Interest: The authors declare that there is no conflict of interest.

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