Atopic dermatitis, sleep and COVID-19 pandemic

Mariana Aparecida Pasa Morgan[1], Priscila Vernizi Roth[1], Renata Drizlionoks[1], Rafaela Cachiolo Antunes[1], Ana Chrystina Souza Crippa[1], and VANIA CARVALHO[1]

[1]Universidade Federal do Parana Departamento de Pediatria

August 9, 2023

Abstract

Background: Atopic dermatitis (AD) is a chronic inflammatory skin disease characterized by pruritus, xerosis and eczema, causing sleep disorders. This study purpose was to examine sleep disorders among children with AD, correlating with disease severity scores, lifestyle, and sleep quality, before and during the coronavirus disease 2019 (COVID-19) pandemic. **Methods:** This is a longitudinal, analytical, prospective, uncontrolled study included 26 patients with AD aged 5–10 years from the Pediatric Dermatology Clinic at a tertiary-care hospital. The Sleep Disturbance Scale for Children Questionnaire and questions about sleep hygiene and lifestyle habits were were used. The severity of AD was determined by the Patient-Oriented Eczema Measure (POEM) index. The first evaluation was presential conducted from October 2019 to March 2020 and the second from September to December 2020 by telephone interviews. **Results:** The severity of AD was considered mild in 76.92% patients in both the evaluations. Sleep disorder was present in 17 (65.38%) patients in the first evaluation and in 11 (42.30%) in the second (*p=0.04*). In the first evaluation, disorders of initiating and maintaining sleep (DIMS) was more frequent in moderate-to-severe AD than in mild AD (83.33% vs. 11.11%, *p=0. 0025*). During the pandemic, six patients (23.07%) reported improvement in sleep quality. **Conclusion**: Sleep quality was negatively influenced by the severity of AD. During the COVID-19 pandemic, there were changes in lifestyle habits and improvement in sleep quality, despite the absence of changes in disease severity.

INTRODUCTION

Atopic dermatitis (AD) is a chronic inflammatory skin disease characterized by pruritus, xerosis, and eczema (1) and is frequent in the pediatric age group (2,3). Approximately 60% of atopic patients have sleep disorders (4), mainly related to the process of falling asleep and the interruption of continuous sleep (5,6,7). Sleep disorders are exacerbated during eczema flare-ups (8), but they can also be associated with other factors besides pruritus (7), such as emotional distress, reduced quality of life, and physical discomfort (9). If left untreated, sleep disorders can increase the risk of metabolic and behavioral alterations, causing attention deficits, mood disorders, weight gain, and neurodevelopmental alterations (10,11,12).

Sudden social and environmental changes trigger anxiety and stress episodes (13), contributing to the onset of sleep disorders (14). As a wide-reaching example, coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was declared a pandemic on March 11, 2020, by the World Health Organization (15). As a measure to mitigate the spread of SARS-CoV-2, educational authorities in Brazil suspended in-person classes in March 2020 (13). Although children infected with SARS-CoV-2 are less symptomatic than infected adults, concerns remain about the transmission of the virus, especially in relation to its spread to elderly members and/or those with comorbidities in the patients' family (16). Consequently, the COVID-19 outbreak determined important changes for a long period in the daily lives of children and their families, influencing the emotional balance, quality of life, educational activity, and health of school children (13,14,17).

Therefore, this study aimed to compare the frequency of sleep disorders in school children with AD before and during the COVID-19 pandemic and to evaluate the relationship with disease severity and lifestyle habits.

METHODS

Design

The initial design was cross-sectional with a prospective convenience sample of 100 patients, with the pandemic data collection had to be suspended and the design was adapted to longitudinal to monitor patients remotely during the pandemic. All the patients included before de pandemic were followed in a longitudinal, analytical, and prospective study included a convenience sample of 26 patients with AD who were aged 5–10 years and were treated at a tertiary hospital in Brazil.

Findings from two evaluations were compared: the first evaluation was conducted from October 2019 to March 2020 with routine outpatient consultation and the second evaluation from September to December 2020 during the COVID-19 pandemic via telephone call.

The study was approved by the by the institution's Ethics and Research Committee under opinion number 16441119.8.0000.0096. Patients and their guardians signed an informed consent form and an informed assent form.

Setting

School children who attended routine consultations and were diagnosed with AD according to the Hanifin–Rajka criteria were included (18). Patients on anxiolytics or with other chronic diseases, except mild rhinitis and asthma, were excluded from the study.

Study variables

In the first evaluation, the participants were clinically assessed for severity of AD by the Scoring of Atopic Dermatitis (SCORAD) index, and they answered validated questionnaires of the Patient-Oriented Eczema Measure (POEM) and Sleep Disturbance Scale for Children. They also completed a questionnaire on sleep hygiene and lifestyle habits prepared by the researchers.

In the second evaluation, the same instruments were used, except for the SCORAD index, and a questionnaire on lifestyle habits during the pandemic was added.

The POEM was validated for Portuguese and is a self-assessment tool comprising seven items, and its purpose is to verify the frequency of AD symptoms within the previous seven days. The seven items are as follows: 1 - pruritus; 2 - sleep disorder; 3 - bleeding lesions; 4 - lesions with secretion; 5 - presence of cracks in the skin; 6 - presence of flaking skin; and 7 - dry or rough skin. Each item is evaluated on a Likert scale with five possible answers for frequency of symptoms: 0 days; 1–2 days; 3–4 days; 5–6 days; and all days; with each answer being scored 0, 1, 2, 3, and 4, respectively. Scores range from 0 to 28, corresponding to clean or almost clean skin (0–2) and mild (3–7), moderate (8–16), severe (17–24), or very severe (25–28) lesions (19). Outcome stratification was adapted by the researchers into mild (score [?]14) and moderate-severe (score >14) symptoms.

The Sleep Disturbance Scale for Children (SDSC) investigates sleep disorders in the previous six months using six factors and 26 items, and it was validated for Portuguese. The factors are: Factor 1 – disorders of initiating and maintaining sleep (DIMS), analyzed by items 1, 2, 3, 4, 5, 10, and 11 (considered 0 without disorder, up to 21 points); Factor 2 - Sleep breathing disorders (SBD), with items 13–15 (considered 0 without disorder, up to 6 points); Factor 3 - Sleep awakening disorders, with items 17, 20, and 21 (considered 0 without disorder, up to 11 points); Factor 4 - Sleep-wake transition disorders, with items 6,7,8,12,18, and 19 (considered 0 without disorder, up to 23 points); Factor 5 - Excessive daytime sleepiness (EDS), analyzed

by items 22 to 26 (considered 0 without disorder, up to 19 points); Factor 6 - Sleep hyperhidrosis (SH), with items 9 and 16 (considered 0 without disorder, up to 7 points) (20,21).

Data were collected in an electronic spreadsheet (Microsoft Excel®). Categorical variables were evaluated with frequency distribution. Statistical analysis was performed using the software R Core Team (2020) (R Foundation for Statistical Computing, Vienna, Austria). Pearson's Chi-square test, Fisher's Exact test, and the Mann–Whitney test were performed. A p value of 0.05 was considered significant.

RESULTS

Patient profiles

A total of 26 children aged 5–10 years were included, 17 (65.38%) of whom were female patients. The mean time between the two evaluations was 9.88 ± 1.68 months. The mean age at the first evaluation was 8.03 ± 1.56 years. Eight (30.77%) patients were in the fourth year of elementary school, which was the most frequent level of education. Overall, 50% of the patients shared the bed and the mean number of persons sharing a room with the patient was 2.38 ±1.20 (Table I).

Regarding the severity of the disease by the SCORAD index, 14 patients (58.83%) were classified with mild AD, nine (34.61%) with moderate, and three (11.54%) with severe. Atopic diseases associated with AD, such as asthma and rhinitis, occurred in 23 (88.46%) patients. As for the medications used for the treatment of AD and/or associated diseases, all the patients used topical moisturizers, 10 (38.46%) used oral antihistamines, and 10 used topical corticosteroids (Table I).

Regarding socioeconomic characteristics, the median family income was R$2,500.00 (range: R$929.00 to R$8,000.00), and the median *per capita* income was R$612.00 (range: R$132.00 to R$2,000.00). Regarding the home environment, the mean number of rooms per household was 5.88 ±1.73. Details about other socioeconomic data, parents' level of education, and associated diseases are shown in Table I.

Patient profile during the pandemic

All the patients stated that they were practicing social distancing. Eleven patients (42.30%) had a relative infected with SARS-CoV-2, and there was one incidence of the death of a relative. Eight (30.76%) patients were not very concerned about the new coronavirus infection. Overall, 25 (96.15%) patients continued their studies remotely and 12 (46.15%) continued in an online class format. Eight (32%) patients reported difficulty in learning. Nineteen (73.07%) reported greater adherence to AD treatment during the pandemic (Table II).

Comparison of sleep quality and severity of AD before and during the pandemic

AD was classified as mild in 20 (76.92%) patients as per the POEM questionnaire, both in the first and second evaluations (Table III).

The first sleep pattern evaluation showed 17 (65.38%) patients with some type of sleep disorder and the second showed 11 (42.30%; p=0.04). SBD was predominant in nine patients (34.61%), followed by SH in eight patients (30.76%). Sleep patterns were re-evaluated during the pandemic, and SBD was the most prevalent in six patients (23.07%), followed by SH in five patients (19.23%).

In the first evaluation, the proportion of patients with mild and moderate-severe AD with DIMS was 11.11% and 83.33%, respectively ($p=0$ .0025). Among the sleep patterns analyzed, SBD occurred in nine (34.61%) participants, and among the 15 patients who reported rhinitis, 53.33% had SBD ($p=0$ .054).

In the second evaluation, the median number of patients with DIMS who used mobile phones before bedtime was 11, whereas that of patients who did not was eight ($p=0$ .029, Figure 1A).

Regarding the sleep hygiene measures evaluated, 22 (84%) patients slept with other people in the room and 13 (50%) shared the bed. Fourteen (53.84%) patients reported an interval between bath and sleep of up to 3 hours, and the room temperature was evaluated as warm and pleasant by 42.30% and 57.69%, respectively. Four (15.39%) patients slept at other times of the day besides night. Regarding ingestion of liquids before bedtime, 10 (38.46%) patients drank water, four (15.84%) drank soda, two (7.70%) drank chocolate milk, and one (3.85%) consumed fatty foods before bedtime.

In the first evaluation, the patients who reported an interval of up to 3 hours between bath and sleep had a median SH score of 6.5, whereas those with an interval of more than 3 hours had a median SH score of 2.0 ($p=0$ .029) (Figure 1B).

When questioned about the parents' opinion on the quality of sleep during the pandemic, six (23.07%), five (19.23%), and 15 (57.69%) perceived improvement, worsening, and no changes, respectively. Among those with worse sleep, two (40%) children attributed the cause to pruritus due to dermatitis.

DISCUSSION

Sleep disorders are described in up to 60% of pediatric patients with AD (22) and is identified as the second most important factor reducing quality of life, after pruritus (9). This study corroborated these data by reporting some type of sleep disorder in 65% of the patients. Delayed sleep onset and frequent night awakenings are the main complaints of children (6) It is known that anxiety and other psychiatric disorders are higher in patients with AD than in the general population, often related to sleep deprivation and social isolation (3). Fishbein et al. (3) demonstrated that children with sleep alterations secondary to eczema and pruritus are more likely to have attention deficit/hyperactivity disorder and oppositional behavior (9), in addition to mood changes (24), neurocognitive disorders, worse verbal comprehension, and less restful sleep (24).

In our study, the frequency of sleep disorders was lower in the evaluation performed during the pandemic (42%) than in the evaluation performed before the pandemic. However, this frequency was 2.3 times higher than the 18% in the healthy pediatric population (26). The results obtained in the present study contradict the findings of Baptista, wherein 42.7% of the 253 parents of healthy children reported worsening of sleep during the pandemic (13). However, a study conducted in Japan revealed that the adequate amount of sleep offered to healthy children due to school closure during the pandemic led to improved sleep quality in 62% of 78 children (27). To the best of our knowledge, no studies were found comparing sleep disorders before and during the pandemic in children with AD. Sleep disorders are rarely isolated in AD (21), and the present study confirmed this finding. Of the 15 (57.69%) patients with rhinitis, most of them (53.33%) had SBD, corroborating the data of Camfferman et al., who described the effect of rhinitis on sleep disorders in AD (9).

With the COVID-19 pandemic and the associated social distancing, children started to study remotely. In the present study, 96.15% of the participants adhered to remote learning, which is higher than the 77.5% reported in another similar previous study (13,28). The increase in screen use caused due to the pandemic may have impaired the sleep hygiene of school children (14). There was a higher prevalence of DIMS in school children who used a cell phone before going to bed than in those who did not use it, and this disorder directly affects the daily functioning of children and may lead to EDS (9). Probably due to this, four of the 26 patients in the present study reported the need to sleep at other times of the day. DIMS was more frequent in patients with moderate-to-severe AD (83.33%) than in those with mild AD (11.11%) ($p=0$ .0025), similar to that reported by Chang and other authors who state that the severity of AD is directly associated with the presence of sleep disorders (2,7,8,9).

In our study, treatment adherence improved in 73.07% of the patients during the pandemic, but with no changes in the severity of AD, with 76.92% of patients with mild AD in both the evaluations. Perhaps this was due to the parents' greater time availability for their children, which allowed for greater supervision

of the use of moisturizers and topical medications (27). The treatment of sleep disorders in AD patients is focused on the control of the underlying disease (8). The use of topical moisturizers is the main treatment for AD (7), and all participants in this study stated that they routinely used moisturizers.

SH was more prevalent in participants with an interval of up to 3 hours from bath to bed than in patients with an interval of more than 3 hours (6.5 and 2, respectively; $p=0$ .029). Fishbein et al. demonstrated that the increase in skin temperature caused by bathing and the warm sleeping environment exacerbated pruritus by impairing the skin barrier (3), which can cause sleep disorders (9). In support of this finding, 57.69% of the participants in the present study considered their bedroom temperature to be pleasant.

In both the evaluations in our study, SBD and SH were the most prevalent, with 34.61% and 30.76% in the first evaluation, respectively, and 23.07% and 19.23% in the second evaluation, respectively. However, Reid et al. evaluated 35 children with AD and found DIMS and EDS as the most frequent sleep disorders (29). Camfferman et al. also found DIMS as the most frequent disorder (42% of 77 patients) in children with eczematous diseases (9). Possibly, the type of sleep disorder varies depending on the population and its context. Further studies of evaluation of sleep disorders in a larger number of AD patients will clarify these data.

The median *per capita* income of the participants was R$612.00 (58%), a value considered relatively low (30), where a low socioeconomic status has been described as a factor associated with a greater risk of sleep disorders, which may be related to the greater number of people sleeping in the same room (9).

The findings of the present study indicate the need for greater attention from health professionals to the sleep complaints of children with AD, which can negatively influence patients' quality of life. In addition, strategies for greater adherence to treatment should be encouraged, given that they can reduce eczema exacerbations and consequently sleep disorders.

Although AD is described to alter sleep, studies investigating sleep disorders and their related factors are still scarce. A more detailed assessment of the patients' medical history is needed, and it would be ideal to conduct studies with polysomnographic sleep parameters and monitoring of the sleep period with videos to obtain additional data and thus avoid problems secondary to non-restorative sleep.

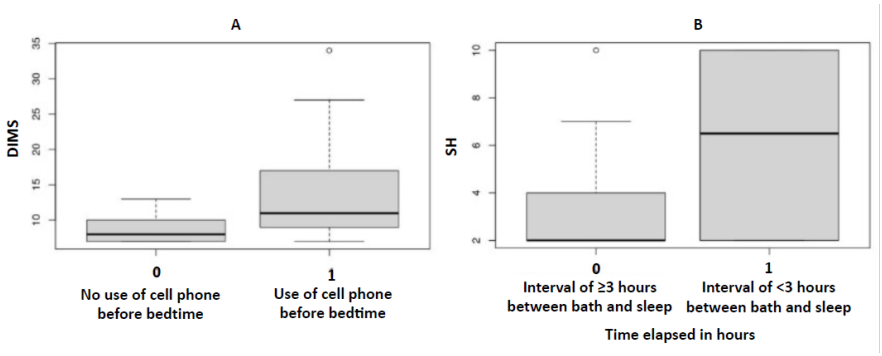
This study has some limitations, such as the small sample size and evaluation on only two occasions, but the results indicate that the severity of AD and the patients' lifestyle habits are related to the higher frequency of sleep disorders. During the social isolation imposed due to the COVID-19 pandemic, despite the stress due to changes in daily routines, parents perceived a greater adherence to the treatment of AD and a reduction in the participants' sleep disorders.

REFERENCES

FIGURE LEGENDS

Figure 1. Variations in sleep disorders according to sleep hygiene.

(A) Variations in sleep initiation and maintenance disorders (DIMS) according to the use of mobile phones before bed (n=26, Mann–Whitney test). (B) Variation in Sleep hyperhidrosis (SH) according to time elapsed between bath and bed (n=26, Mann–Whitney test).



Hosted file

`Tables.docx` available at https://authorea.com/users/650702/articles/659070-atopic-dermatitis-sleep-and-covid-19-pandemic