Association between Sleep Problems and Psychopathologies among Preschoolers: A Brazilian Cross-Sectional Study

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Abstract

Objective   To evaluate the relationship between sleep problems and psychopathologies in Brazilian preschool children.

Materials and Methods   The present is a cross-sectional study with162 children: 81 with sleep problems referred for treatment (mean age: 3.67 years), matched by gender/age with 81 participants without sleep problems. Sleep problems were identified through a clinical interview with a specialist. Psychopathologies were evaluated using the Child Behavior Checklist for Ages 1.5-5 (CBCL/1.5-5).

Results   Having sleep problems was a predictor of all forms of psychopathologies on the CBCL scales, except for the withdrawn scale. Aggressive behavior, depression/anxiety, affective problems, and oppositional defiant disorder were associated with presence of sleep problems.

Conclusion   Given the probable bidirectionality of the association between sleep problems and psychopathologies in children, it is suggested that regular assessments of both phenomena should be performed in children referred for treatment of sleep problems and mental health problems in general.

Keywords
► child
► sleep
► psychopathology
► behavior

Introduction

Sleep problems are common, with a prevalence of 20% to 30% among infants, toddlers, and preschool-aged children.[1] These disturbances are one of the most common behavioral issues observed by primary care providers and they can take many forms, including dyssomnias and parasomnias.[2,3] Broadly, insomnia is the most common form of dyssomnia in childhood; it manifests as difficulty in falling asleep and/or staying asleep,[4] and it is often the result of inappropriate sleep associations or inadequate limit setting on the part of caregivers.[5] Indeed, the most reported complaints by parents are bedtime problems/resistance, night awakenings, short sleep duration, and parasomnias, such as nightmares and sleep talking.[1,6–8]

The association regarding sleep problems and psychopathology symptoms is also well documented in the literature. Studies[7–9] have shown significant correlations between sleeping difficulties and mental health problems in young children, including anxiety, aggressive behavior, attention deficit/ hyperactivity disorder (ADHD), and affective problems.

Van Dyk et al.[7] (2019) examined the prevalence of parent-reported psychopathology symptoms (DSM-oriented sub-scales of the Child Behavior Checklist [CBCL]) and their associations with sleep disruption in 373 American preschoolers presenting to a behavioral sleep medicine clinic. The results indicated that 69% of the children had clinically-elevated psychopathology symptoms, such as depression/mood disorders (54.4%), ADHD (28.7%), anxiety and related disorders (24.0%), pervasive developmental disorder (27.6%), and oppositional defiant disorder or/and behavior issues (30.8%). The results also demonstrated that symptoms of ADHD and affective disorders were most consistently associated with sleep problems, such as bedtime resistance, delay in sleep onset, sleep duration, sleep anxiety, wake after sleep, parasomnias, sleep-disordered breathing, and daytime sleepiness, measured by the Child Sleep Habits Questionnaire.[7]

Although the relationship between sleep problems and psychopathologies in childhood is evident in the present as well as in similar studies, most of these studies[7] were conducted with children from developed countries in the Northern Hemisphere, with community samples or with patients presenting for mental health treatment. Few studies[9] have evaluated this association in low- and middle-income countries or in countries in the Southern Hemisphere. Moreover, a reduced number of studies[9] have investigated the association between sleep and behavioral/emotional issues in children referred to treatment for sleep problems and compared these samples with children without sleep problems. This comparison is important to understand the different manifestations of psychopathology in the presence or absence of sleep problems.

Given the links between sleep problems and psychopathology symptoms, the present study evaluated the relationship among sleep problems and behavioral problems (emotionally reactivity, anxiety/depression, somatic complaints, withdrawal, attention problems, aggressive behavior) and psychopathologies (affective, anxiety, pervasive developmental, and oppositional defiant disorders, as well as ADHD) in preschool children. Our first hypothesis was that sleep problems would be associated with behavioral and emotional issues in this Brazilian sample. Our second hypothesis was that these sleep problems would also be associated with various forms of psychopathology in these children.

Materials and Methods

Study Design and Participants

The current is a cross-sectional study that used data from two randomized clinical control trials conducted in Brazil[10,11] on the effectiveness of behavioral treatments for sleep problems in children. The first group consisted of 81 children with sleep-related behavioral issues, such as bedtime problems, night waking, cosleeping with parents, and nighttime fears.

The inclusion criteria were: 1) children aged between 2 and 5 years who presented sleep-related behavioral issues (sleep onset insomnia, insomnia due to limit-setting difficulties, and/or a combination of the two) or who coslept and avoided sleeping alone; 2) children with one or more of the following

characteristics at a frequency of at least three times a week: a) taking 30 minutes or more to fall asleep; b) resistance and/or protests against going to bed; c) reluctance or inability to go to bed without arguing, crying, complaining, or otherwise delaying bedtime; d) Reluctance or inability to fall asleep alone without being close to an attachment figure; e) night wakings; f) reluctance or inability to sleep all night in their own bed, without calling their parents or going to the parent's bed at night; and g) only sleeping in the presence of parents; 3) children with sleep problems for at least six months with an adverse impact on themselves and their families, impairing the quality of sleep and family relations. These criteria were checked in the clinic interview with a psychologist, which was based on a structured interview with the child's parents. According to the parental report, none of the 81 children included in the first group were under pharmacological treatment.

The second group also consisted of 81 children, matched by age and gender, who were enrolled in Kindergarten in the city of São Paulo. The parents indicated that the children had not been referred for any mental health service in the previous six months nor had they any nighttime sleeping problems. In both groups, children with neurological impairment and/or psychotic symptoms, as reported by the parents, were excluded.

Procedures

The study procedures were conducted with the approval of the Research Ethics Committee of the universities where services were provided (approval numbers: 2.541.684, 138.675, and 1.505.273). The caregivers of the children provided written consent, and ethical guidelines for research in human beings were followed. The parents filled out the instruments in sessions that lasted ∼ 30 minutes. The researchers provided explanations about the instruments and asked whether parents preferred to fill them out with or without assistance. Even when the parent chose not to be assisted, the researcher remained in the room in case they had any questions.

Measures

Sociodemographic questionnaire: Information regarding age, gender, parental level of schooling, marital status, and household income were obtained.

Child Behavior Checklist for Ages 1.5-5 (CBCL/1.5-5): This is an instrument developed by Achenbach and Rescorla[12] (2001) to obtain standardized measures of behavioral/emotional issues in children aged between 18 months and 5 years based on parental reports. The 99 items are rated on a 3-point Likert scale in which 0 indicates "Not True – as far as you know," 1, "Somewhat or Sometimes True," and 2, "Very True or Often True." The items are grouped into seven empirically-derived problem subscales: Emotional Reactivity, Anxiety/Depression, Somatic Complaints, Withdrawal, Sleep Problems, Attention Problems, and Aggressive Behavior. The subscale scores can be added to form a total score. The Sleep Problems Scale was our primary dependent measure of interest. In addition to the

empirically-based subscales, the CBCL also groups items into five subscales oriented by the Diagnostic and Statistical Manual of Mental Disorders (DSM): Affective Problems, Anxiety Problems, Autism Spectrum Disorder, ADHD, and Oppositional Defiant Disorder. The Brazilian version of the CBCL/1.5–5 presents good reliability indices: test-retest interclass correlation coefficients of 0.99 for internalizing problems, 0.99 for externalizing problems, and 0.98 for total problems. It also presents acceptable internal consistency values (Cronbach α) ranging from 0.69 (somatic problems) to 0.94 (total problems)[20]. For the present study, reliability was estimated using the Cronbach α coefficient: 0.81 for the DSM subscales 0.73 for internalizing problems, and 0.68 for externalizing problems.

Data Analysis

The statistical analyses were performed using the IBM SPSS Statistics for Windows (IBM Corp., Armonk, NY, United States) software, version 20.0, and significance was set at the 5% level ($p < 0.05$). The values of the descriptive analyses are presented as proportions, means, and standard deviations (SDs). For the continuous variables, comparisons were made using the t-test for independent samples, the Mann-Whitney test for continuous variables, and the Chi-squared test for categorical variables.

For multiple linear regression, the stepwise method was used for the six syndrome variables (Emotional Reactivity, Anxiety/Depression, Somatic Complaints, Withdrawal, Attention Problems and Aggressive Behavior) as well as the five DSM subscales (Affective Problems; Anxiety Problems; Pervasive Developmental Problems; ADHD; Oppositional Defiant Disorder) to predict the CBCL syndrome variable of *sleep problems*.

Results

The characteristics of the children and their parents are presented in ►Table 1. The age of the children ranged from 2 to 5 years, and slightly more than half of the children were boys. Maternal age ranged from 19 to 46 years, and most parents were married. Significant differences were found between the case and control groups regarding maternal age and level of schooling and household income. Age and gender did not differ much among the children because the groups were carefully matched for these variables.

On average, the case group took more than 30 minutes to fall asleep (mean: 41.8 ± 25.8 minutes), with bedtime after 9pm (mean: $10:32 \pm 10:25$pm) and slept an average of 9.3 (± 1.1) hours per night. Cosleeping and night waking were frequent with means of 4.9(± 2.6) and 5.6(± 2.07) nights per week respectively. Overall, 54.3% of these children coslept with their parents every night of the week, and 43.2% woke up at least once during the night.

Given the sociodemographic differences between the two groups, the results were analyzed by controlling for maternal age and level of schooling, as well as household income.

Sleep Problems as a Predictor of Other Psychopathologies and Behavioral Problems

As displayed in ►Table 2, the linear regression showed that sleep problems, even when controlled by household income and maternal age and level of schooling, were significant in the prediction of all psychopathology and behavioral problems subscales, except for the withdrawal subscale.

Factors Associated with Presence of Sleep Problems

As displayed in ►Table 3, the logistic regression analyses showed that ADHD, Aggressive Behavior, Anxiety/Depression, Affective Problems, and Oppositional Defiant Disorder were all significantly and positively associated with the presence of sleep problems, even after controlling for household income and maternal age and level of schooling.

Discussion

One of the objectives of the present study was to compare the prevalence of indicators of psychopathologies in a sample of

Table 1 Descriptive measures and sample differences.

		With sleep problems ($n = 81$)	Without sleep problems ($n = 81$)	*p*
Children				
Age in (years): mean ± standard deviation		3.67 ± (1.0)	3.67 ± (1.0)	1.000[b]
Gender: n (%)				
Female; male		38 (46.91); 43 (53.09)	38 (46.91); 43 (53.09)	1.000[a]
Mother				
Age (in years): mean ± standard deviation		34.852($\pm$5.496)	32.395($\pm$6.917)	0.013[*b]
Marital status: n (%)				
Married; separated		68 (83.951); 13 (16.049)	60 (74.074); 21 (25.926)	0.123[a]
Level of schooling: n (%)				
High school; higher education		25 (30.864); 56 (69.136)	65 (80.247); 16 (19.753)	0.000[**a]
Household income: mean ± standard deviation		4103.691($\pm$2736.896)	2803.198($\pm$2666.763)	0.020[*c]

[a]Chi-squared test; [b]t-test for independent samples; [c]Mann-Whitney test; [*]$p < 0.005$; [**]$p < 0.001$.

Table 2 Sleep problems as predictors of other psychopathologies and behavioral problems.

	Unstandardized β	R^2	95% confidence interval		*p*
			Lower	Upper	
Behavioral problems					
Emotional reactivity	0.25	0.16	0.15	0.34	0.001
Anxiety/Depression	0.30	0.27	0.22	0.39	0.001
Somatic complaints	0.11	0.04	0.02	0.19	0.010
Withdrawal	0.08	0.11	0.98	1.02	0.073
Attention problems	0.22	0.16	0.13	0.30	0.001
Agressive dehavior	0.31	0.34	0.23	0.39	0.001
Psychopathologies					
Affective problems	0.36	0.42	0.29	0.43	0.001
Anxiety problems	0.37	0.30	0.28	0.47	0.001
Pervasive developmental problems	0.10	0.07	0.01	0.19	0.024
Attention deficit/ hyperactivity disorder	0.31	0.28	0.23	0.39	0.001
Oppositional defiant disorder	0.26	0.27	0.18	0.34	0.001

Brazilian children diagnosed with sleep problems and in a sample of children without sleep problems. Corroborating our hypothesis, the results indicated a higher prevalence of internalizing problems, such as depression and anxiety, as well as externalizing problems, such as opposition and aggressiveness in the case group. We also investigated whether sleep problems would be predictors of psychopathologies among the participating children. In our sample, sleep problems predicted all psychopathologies investigated by the CBCL.

Currently, it is known that adequate sleep plays an important role in the repair of neuronal connections of the central nervous system, and, particularly, of the structures that make up the limbic system, which is responsible for the mechanisms of impulse control and emotional regulation.[13] Thus, it is reasonable to assume that sleep deprivation impairs the social and emotional functioning of the child, who is more likely to behave aggressively, with greater intolerance to frustration and lower levels of impulse control, which puts them at a higher risk of developing mental disorders, such as depression, anxiety, oppositional defiant disorder, and other impulse-related disorders.

Moreover, it is also known that sleep deprivation reduces the ability to focus, and pay attention, and that it globally impairs cognitive processing.[14,15] This aspect is central, because childhood is a critical period of development regarding the acquisition of academic and social and emotional knowledge, as well as skills that will be required throughout the development of the individual in progressively more complex contexts. These results are important from a public health perspective, since behavioral strategies designed to treat sleep problems are effective and low-cost,[10,11] and may help improve sleep quality in children.

The normalization of sleep problems places the child in a more favorable condition both in terms of mental health and of the ability to acquire new knowledge and skills. This development is critical, both from the point of view of

reducing the suffering of the child and of their family and from an economic point of view. This is especially important in Brazil, since a large portion of the population depends on the mental health services available in the public health system, which, although in theory involves free access of the user in childhood and adolescence, in practice, still presents coverage deficits, especially in recent years.

Moreover, these results highlight the importance of regular evaluations of psychopathologies among children with sleep problems, since early detection and treatment require reduced response costs in terms of treatment and are associated with better prognosis.[16,17]

We found that presenting symptoms of psychopathologies at the clinical level on the subscales of ADHD, Aggressive Behavior, Anxiety/Depression, Affective Problems, and Oppositional Defiant Disorder were factors associated with the presence of sleep problems in children. These results make sense from a pathophysiological point of view, as emotional problems such as depression and anxiety tend to alter the sleep-wake cycle, resulting in insomnia, early awakening, and hypersomnia.[13–15]

We did not find an association between attention problems at a clinical level and sleep problems, but ADHD was associated with sleep disorders, and similar results were found in a recent systematic review.[18] We believe that the component most related to sleep problems is hyperactivity, not attention deficit. In clinical terms, it is reasonable to assume that preschool children who are more agitated or restless have more difficulty remaining in a calm state, which does not favor the onset of sleep.

Again, we did not find associations between pervasive developmental problems at a clinical level and sleep problems. This result contradicts studies[19] that indicate that children with neurodevelopmental disorders, such as autism spectrum disorders, tend to have more sleep problems compared with children with typical development. This result should be

Table 3 Behavioral problems and psychopathologies associated with the presence of sleep problems.

	Without sleep problems ($n=81$)	With sleep problems ($n=81$)	OR (95%CI)	p
Behavioral problems: n (%)				
Emotional Reactivity				
T-score $\geq$ 65	21 (25.93)	28 (34.57)		
T-score $<$ 65	60 (74.07)	53 (65.43)	1.78 (0.81–3.94)	0.151
Anxiety/Depression				
T-score $\geq$ 65	20 (24.69)	34 (41.98)		
T-score $<$ 65	61 (75.31)	47 (58.02)	5.91 (2.36–14.79)	0.001
Somatic complaints				
T-score $\geq$ 65	15 (18.52)	16 (19.75)		
T-score $<$ 65	66 (81.48)	65 (80.25)	1.27 (0.51–3.16)	0.599
Withdrawal				
T-score $\geq$ 65	7 (8.64)	13 (16.05)		
T-score $<$ 65	74 (91.36)	68 (83.95)	2.50 (0.76–8.28)	0.131
Attention problems				
T-score $\geq$ 65	11 (13.58)	20 (24.69)		
T-score $<$ 65	70 (86.42)	61 (75.31)	2.28 (0.88–5.94)	0.089
Aggressive behavior				
T-score $\geq$ 65	7 (8.64)	19 (23.46)		
T-score $<$ 65	74 (91.36)	62 (76.54)	6.37 (2.03–19.98)	0.002
Psychopathologies: n (%)				
Affective problems				
T-score $\geq$ 65	13 (16.05)	33 (40.74)		
T-score $<$ 65	68 (83.95)	48 (59.26)	6.70 (2.64–17.04)	0.001
Anxiety problems				
T-score $\geq$ 65	19 (23.46)	62 (76.54)		
T-score $<$ 65	62 (76.54)	19 (23.46)	13.42 (5.43–33.16)	0.001
Pervasive developmental problems				
T-score $\geq$ 65	13 (16.05)	19 (23.46)		
T-score $<$ 65	68 (83.95)	62 (76.54)	2.38 (0.93–6.07)	0.069
Attention deficit/ hyperactivity disorder				
T-score $\geq$ 65	11 (13.58)	23 (28.4)		
T-score $<$ 65	70 (86.42)	58 (71.6)	3.92 (1.53–10.05)	0.004
Oppositional defiant disorder				
T-score $\geq$ 65	11 (13.58)	22 (27.16)		
T-score $<$ 65	70 (86.42)	59 (72.84)	4.81 (1.83–12.66)	0.001

Abbreviations: 95%CI, 95% confidence interval; OR, odds ratio.

analyzed with caution, since the CBCL is not a diagnostic instrument, and the specificity and sensitivity of the pervasive developmental problems subscale is relatively low. Emotional reactivity, somatic complaints, and withdrawal were also unrelated to sleep problems.

Thus, the findings point to the importance of evaluating sleep problems among children with mental health issues, especially among children with internalizing problems, such

as depression and anxiety, and externalizing ones, such as aggressive and oppositional behavior.

Limitations and Future Directions
The present study has limitations that should warrant care in the interpretation of the findings. First, the sample was relatively small, which may reduce the internal validity of the study and possibly limit the generalizability of our

findings. Studies on the associations between sleep problems and psychopathologies with representative samples of the broader Brazilian population are necessary. Second, sleep variables were only assessed through parent-report; therefore, our reliance on caregiver-reported variables may have left the study vulnerable to reporting bias. Future studies should also use objective measures of sleep such as actigraphy. This methodology, together with the self-report instruments, would be useful in the evaluations, providing greater detail of the characteristics of sleep in this population. Third, the absence of a structured diagnostic interview does not enable us to discuss the data in terms of the diagnoses. Future studies should include a structured diagnostic interview. This would enable the control of comorbidities that could interfere with sleep. Fourth, the associations found in the present study may have been confounded by other variables that were not assessed and consequently not adjusted for. Fifth, the cross-sectional design does not enable conclusions on causality. Cohort studies may investigate the direction of the effects herein found. Such studies are essential to evaluate the causal effect between psychopathology and sleep problems in Brazilian children.

Conclusion

We found that presenting sleep problems was a predictor of several types of psychopathology, both internalizing and externalizing. We also found that signs and symptoms of psychopathologies at the clinical level were associated with increases in sleep problems. Given the probable bidirectionality of the association between sleep problems and psychopathologies in the present study, we suggest the regular performance of assessments of both phenomena in young children referred for treatment of sleep problems and of other mental health problems as well.

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