การสำรวจปัญหาการนอนของเด็กวัยเรียน: การวิเคราะห์ภาคตัดขวาง และความสัมพันธ์กับการมีวินิจฉัยโรคจิตเวชของเด็ก คุณภาพการนอน และความเครียดของผู้เลี้ยงดู

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บทคัดย่อ

วัตถุประสงค์ เพื่อศึกษาความแตกต่างของปัญหาการนอนระหว่างเด็กวัยเรียนที่มีโรคจิตเวชและกลุ่มควบคุม และเพื่อศึกษาความสัมพันธ์ระหว่างปัญหาการนอนหลับในเด็กวัยเรียนกับการมีวินิจฉัยโรคจิตเวช รวมถึงคุณภาพการนอนและความเครียดของผู้เลี้ยงดู

วิธีการศึกษา การวิจัยนี้ใช้การสำรวจแบบภาคตัดขวาง (cross-sectional study) โดยทำการเก็บข้อมูลในเด็กไทย อายุ 6 - 10 ปี ที่ได้รับการวินิจฉัยโรคทางจิตเวชเปรียบเทียบกับกลุ่มควบคุม ซึ่งเป็นนักเรียนชั้นประถมศึกษาปีที่ 1 - 4 จากโรงเรียนรัฐบาล สำหรับปัญหาการนอนในเด็กนั้นจะใช้แบบสอบถามปัญหาการนอนในเด็กฉบับภาษาไทย (the Children's Sleep Habits Questionnaire (CSHQ) - Thai version) และใช้แบบสอบถามคุณภาพการนอนหลับของพิทส์เบิร์กฉบับแปลภาษาไทย (The Pittsburgh Sleep Quality Index (PSQI) - Thai version) และใช้แบบวัดความรู้สึกเครียด (Thai Perceived Stress Scale-10 (T-PSS-10)) เพื่อประเมินปัญหาการนอนและความเครียดของผู้เลี้ยงดู จากนั้นจะนำข้อมูลที่ได้มาวิเคราะห์โดยใช้การถดถอยโลจิสติก (binary logistic regression) เพื่อหาปัจจัยที่มีความสัมพันธ์ต่อปัญหาการนอนในเด็กและหาความสัมพันธ์ระหว่างปัญหาการนอนหลับในเด็ก และใช้การวิเคราะห์สมการถดถอยพหุคูณแบบเป็นขั้นตอน (stepwise multiple regression analysis) เพื่อหาปัจจัยที่มีความสัมพันธ์ต่อคะแนนรวมของ CSHQ

ผลการศึกษา มีผู้เข้าร่วมในการศึกษาทั้งหมด 202 คน ประกอบด้วยเด็กที่มีโรคทางจิตเวชจำนวน 87 คน และเด็กในกลุ่มควบคุมจำนวน 115 คน โดยเด็กในกลุ่มที่มีโรคทางจิตเวชจะมีค่าเฉลี่ยของคะแนนรวมของ CSHQ สูงกว่า เมื่อเปรียบเทียบกับกลุ่มควบคุม (49.99 และ 47.82) และในกลุ่มเด็กที่มีโรคทางจิตเวชจะพบร้อยละของเด็กที่มีปัญหาการนอนมากกว่าในกลุ่มควบคุมอย่างมีนัยสำคัญ (57.47% และ 45.22%) สำหรับปัจจัยที่มีความสัมพันธ์แบบมีนัยสำคัญทางสถิติกับปัญหาการนอนของเด็ก ได้แก่ การมีวินิจฉัยโรคจิตเวช การใช้ยา ปัญหาการนอนหลับและความเครียดของผู้เลี้ยงดู อย่างไรก็ตามเมื่อทำการวิเคราะห์สมการถดถอยพหุคูณแบบเป็นขั้นตอนพบว่า ตัวแปรที่มีผลต่อคะแนนรวมของ CSHQ อย่างมีนัยสำคัญทางสถิติ คือ การมีวินิจฉัยโรคจิตเวช ดื่มเครื่องดื่มที่มีส่วนประกอบของคาเฟอีนหลัง 5 โมงเย็น คะแนนความเครียดของผู้เลี้ยงดู และรายได้ต่อเดือนของผู้เลี้ยงดู

สรุป เด็กที่มีวินิจฉัยโรคจิตเวชจะมีความเสี่ยงสูงที่จะเกิดปัญหาการนอน แต่อย่างไรก็ตามปัจจัยอื่นๆ เช่น การดื่มเครื่องดื่มคาเฟอีน ความเครียดของผู้เลี้ยงดู และรายได้ต่อเดือนของผู้เลี้ยงดูก็มีผลต่อปัญหาการนอนของเด็กเช่นเดียวกัน ดังนั้นจึงควรค้นหาและรักษาปัญหาการนอนในเด็กทุกคนโดยเร็ว ควบคู่ไปกับการส่งเสริมสุขอนามัยการนอนที่ดี และการจัดการความเครียดทั้งในเด็กและผู้เลี้ยงดูก็มีความสำคัญ เพื่อให้เกิดสุขภาวะที่ดีอย่างเป็นภาพรวม

คำสำคัญ ปัญหาการนอนในเด็ก โรคจิตเวชในเด็ก คุณภาพการนอนของผู้ดูแล ความเครียดของผู้ดูแล

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Exploring Sleep Problems in School-Age Children: A Cross-Sectional Analysis and Association with Children's Psychiatric Diagnoses, Caregivers' Sleep Quality, and Stress

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ABSTRACT

Objective: This study aimed to investigate the differences in sleep disturbance between children with psychiatric disorders and a control group and to explore the relationship between children's sleep disturbances and psychiatric diagnoses, as well as caregivers' sleep problems and stress.

Methods: In this cross-sectional analytic study, the data were recruited from Thai children aged 6 - 10 years with any psychiatric diagnosis and compared with a control group consisting of students in grades 1 - 4 from a public school. Children's sleep disturbances were examined using the Children's Sleep Habits Questionnaire (CSHQ) - Thai version. The Pittsburgh Sleep Quality Index (PSQI) - Thai version and the Thai Perceived Stress Scale-10 (T-PSS-10) were used to evaluate caregivers' sleep problems and stress. The binary logistic regression was employed to examine factors related to children's sleep disturbances. Additionally, a stepwise multiple regression analysis was conducted to pinpoint the significant factors relating to children's total CSHQ scores.

Results: Among 202 participants, 87 had psychiatric disorders, and 115 were controls. Those with psychiatric disorders had higher mean CSHQ scores (49.99 vs. 47.82) and a significantly higher percentage of sleep disturbances (57.47% vs. 45.22%) compared to controls. The significant associated factors with sleep disturbance in children were psychiatric disorders, medication use, caregivers' sleep quality, and stress levels. Adjusting for confounding variables with stepwise multiple regression analysis revealed that psychiatric diagnosis, consuming caffeine after 5 PM, caregiver stress levels, and monthly income were significant predictors of total CSHQ scores.

Conclusion: Children with psychiatric disorders have a high risk of sleep disturbances. However, other factors such as caffeine intake, caregiver stress, and caregiver's monthly income also play a role. Early identification and intervention for sleep problems in all children, along with promoting sleep hygiene and stress management for both caregivers and children, are crucial for overall well-being.

Keywords: Children sleep disturbance, Psychiatric disorders, Caregivers' Sleep quality, Caregivers' stress

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INTRODUCTION

Quality sleep is essential for the overall physical and mental development of children during early life. Sleep problems in children are associated with cognitive and behavioral deficits,[1-3] social-emotional problems,[4,5] height growth deficits, and obesity.[6,7] These issues significantly impact children and adolescents in various functional settings.[8]

The most common sleep problems in Thai school-aged children were in the domains of daytime sleepiness, bedtime resistance, and sleep anxiety.[9] In other studies, approximately 15 - 44% of parents perceived that their child had a sleep problem.[10] Bedtime resistance has been reported in 10 - 15% of toddlers, and around 15 - 30 % of preschool-aged children have insomnia.[11-13]

Children diagnosed with psychiatric disorders face a high risk of sleep problems compared to those without such disorders. For instance, parents of autistic children reported sleep problems in 50 - 80% of cases, a rate higher than children with other developmental disorders like Down syndrome and cerebral palsy.[14,15] Similarly, some studies have indicated a high prevalence of sleep disorders in Attention Deficit Hyperactivity Disorder (ADHD), with rates reaching 25 - 50%.[15] Additionally, in up to 95% of children with anxiety disorders, parental reports indicate sleep problems,[16] despite limited self-reports from the children themselves. Moreover, sleep problems and psychiatric disorders have reciprocal relationships; psychiatric disorders can lead to or exacerbate sleep problems, just as insufficient sleep can interfere with a child's ability to regulate emotions and behavior, worsen attention deficit symptoms and lead to other mental health problems and disorders.[15,17]

In studies conducted in Thailand focusing on sleep problems in children with mental health disorders, it was discovered that ASD children experienced a high rate of sleep disturbances at 89.2%. The prevalent sleep problem domains were bedtime resistance, sleep anxiety, and sleep-disordered breathing.[18] Notably, correlations were found between sleep habits and behavioral problems, with specific sleep issues being significantly linked to particular behavioral challenges. For instance, sleep-disordered breathing was notably associated with irritability, lethargy, hyperactivity/noncompliance, and inappropriate speech.[19] Additionally, children with ADHD in the same studies exhibited a sleep problem prevalence of 72.9%. Common patterns included the need for parents to stay with them at bedtime, a fear of sleeping in the dark, and difficulty falling asleep.[20] Compared to controls, children with ADHD had significantly higher scores in all subscales of the Children's Sleep Habits Questionnaire (CSHQ).[21]

The quality of children's sleep impacts the quality of maternal sleep. Additionally, maternal sleep quality serves as a significant predictor of maternal mood, stress, and fatigue.[22,23] Poor sleep quality in children predicts maternal stress and an increased sense of burden related to childcare responsibilities. However, research on the links between children's sleep and parental personality and psychopathology has been limited, with most studies focusing on maternal depression.[24] Some studies have reported that actigraphic measures indicating poor and insufficient maternal sleep are associated with both maternal experiences of stress and less observed positive parenting.[25] A systematic review on sleep problems in children with ADHD and ASD found that parenting stress and parental mental health are linked to children sleep problems.[26] In summary, children's sleep problems not only affect the children themselves but also have an impact on emotions, stress levels, and the parenting quality of parents.

However, in Thailand, studies on sleep problems in children with psychiatric are still limited, and there is a lack of clear research on the relationship between children's sleep problems and the stress and sleep problems of caregivers. Therefore, the objectives of this study are as follows:1) to investigate the differences in sleep problems between children with psychiatric disorders and those in the control group, and 2) to explore the relationship between children's sleep problems and caregivers' sleep problems and stress

METHODS

Study design and participants

The objective of this cross-sectional study is to compare sleep problems between children with psychiatric disorders and those in a control group. To calculate the sample size, we employed the formula for comparing two independent sample proportions.

$$n = (Z_{a/2} + Z_{\beta})^2 * (P_1(1-P_1) + P_2(1-P_2))/(P_1 - P_2)^2$$

We selected a significance level of α=0.05 and a statistical power of 1-β=0.80. The estimated proportions of children experiencing sleep problems were P1=0.20 for the school-age general population[27-29] and P2=0.40 for those with psychiatric disorders.[30] We accounted for a dropout rate of 20%. Plugging these values into the formula yielded a required sample size of n =98 in each group, resulting in a total sample size of 196.

The study was conducted at Ramathibodi Hospital and Wat Udomrungsri School, a public elementary school comprising grade 1 to grade 6 in Bangkok, Thailand. The school was chosen for its accessibility and representation of a typical community school system. The study took place from June to September 2023. Participants were divided into two groups: the psychiatric diagnosed group and the control group. Inclusion criteria for the psychiatric diagnosed group included children aged 6 - 10 years with any psychiatric diagnosis, such as ADHD, Autism Spectrum Disorder (ASD), or Depressive Disorder, diagnosed by child and adolescent psychiatrists and developmental-behavioral pediatricians. These children were attending as new or follow-up cases at the outpatient department of psychiatry or developmental and behavioral pediatric clinic at Ramathibodi Hospital. For the control group, students without any psychiatric disorders, assessed through a demographic and personal questionnaire, in grades 1 to 4, studying at Wat Udomrungsri School, were recruited. In both groups, caregivers needed to be fluent in reading and writing in the Thai language. Exclusion criteria included failure to complete the questionnaire or were unwilling to participate in the study. All caregivers who were living with the children and could confidently provide information were required to provide informed consent. The questionnaire was in paper-pencil form and was distributed to all participants. In total, 87 participants were recruited for the psychiatric diagnosed group, and 115 for the control group, resulting in a combined enrollment of 202 participants.

Demographic and personal data

Caregivers provided demographic and personal data of children through a questionnaire, including age, sex, underlying medical and psychiatric disorders, medication, family income, history of COVID-19 infection, average hours of screen time per day, bedroom environment, and sleep practices (as detailed in Table 1).

Children sleep disturbances and patterns

The Children's Sleep Habits Questionnaire (CSHQ) is a widely utilized parent-report tool designed to assess sleep patterns and issues in children aged 4 to 10 years. Comprising 33 scoring items, the CSHQ is organized into eight dimensions: bedtime resistance, sleep onset delay, sleep duration, sleep anxiety, night waking, parasomnia, sleep-disordered breathing, and daytime sleepiness. Caregivers are prompted to recall their child's sleep behaviors over a recent week, rating each item on a 3-point Likert scale (rarely=0 to 1 times/week; sometimes=2 to 4 times/week; usually=5 to 7 times/week). Scores on the CSHQ range from 33 to 99. Generally, higher scores indicate a greater chance of sleep problems in children. In the US, a score of 41 or above is commonly used as a marker for needing further evaluation of sleep disturbances.[31]

The CSHQ has been adapted for various cultural contexts, including a Thai version with good internal consistency (total scale: 0.83).[32] However, previous Thai studies[18,19,21] have reported higher total score ranges (47.54 - 52.92) than those observed in the US population.[31] In response to this cultural variance and to ensure precise identification of sleep disturbances, we opted for a cutoff point of ≥48 (sensitivity: 69.44%, specificity: 78.93%, AUC:

0.795) based on research conducted in Japan.[33] Certain CSHQ questions, such as "Child needs a parent in the room to fall asleep" and "Child falls asleep in a parent's bed or sibling's bed," notably influenced scores in this context. The prevalent co-sleeping practices influenced the higher threshold, significantly affecting children's sleep patterns.[33] A previous study in Thailand, echoing findings in Japanese children, revealed that approximately 60% of parents reported their children needing a parental presence in their bedrooms to sleep and fearing to sleep alone.[13] This decision aimed to better account for the cultural nuances of the Thai population, ensuring the relevance and accuracy of sleep disturbance identification.

Caregiver Sleep Quality

The Pittsburgh Sleep Quality Index (Thai-PSQI) is a self-reported measure of sleep quality and disturbances over the previous month. This questionnaire comprised 19 items that evaluated the seven components of sleep quality: Subjective sleep quality, Sleep latency, Sleep duration, Habitual sleep efficiency, Sleep disturbances, Use of sleeping medication, and Daytime dysfunction. Each component scores ranging from 0 (no difficulty) to 3 (severe difficulty). The summation of all component scores is called the PSQI global score (range from 0 - 21), with a higher score indicating greater dysfunction; a score >5 suggests significantly poor sleep quality. The Thai version of PSQI had been validated with good psychometric properties and has been used to study in various populations with the Cronbach's alpha was 0.84; test-retest reliability was 0.89; the sensitivity for discriminating good sleepers from poor sleepers was 77.78%, and the specificity for correctly classifying good sleepers was 93.33%.[34]

Caregiver Perceived Stress

The Thai Perceived Stress Scale-10 (T-PSS-10) is the Thai version of the Perceived Stress Scale -10 (PSS-10), originally developed by Cohen, Kamarak, and Mermelstein.[35] This self-assessment tool measures how stressful people find life events. This scale addresses an individual's perception of their life, asking them to assess aspects of their life as unpredictable, uncontrollable, and overwhelming. Although the PSS-10 is more focused on global stressors rather than specific life events, it is sensitive to chronic stress resulting from life circumstances. The tool consists of 10 questions in which respondents indicate how often they have felt or thought a certain way within the past month, using a 5-point Likert scale ranging from 0 (never) to 4 (very often). The total score ranges from 0 to 40, with higher composite scores indicating more perceived stress. The scores can be categorized into three groups: low stress (score 0 - 13), moderate stress (score 14 - 26), and high perceived stress (score 27 - 40).[36] The T-PSS-10 has demonstrated good reliability and validity for estimating the level of stress perception in a Thai population with a Cronbach's α of 0.84 and the interclass correlation coefficient of 0.83 (95% confidence interval, 0.722 - 0.881). T-PSS-10 scores were also found to positively correlate with the State Trait Anxiety Inventory (STAI) and the Thai Depression Inventory (TDI). Conversely, they were negatively correlated with the Rosenberg Self-Esteem Scale.[37]

The study was approved by the Institute Review Board (IRB) of Ramathibodi Hospital, Mahidol University; MURA2023/296.

Statistical analysis

We conducted our analyses using Stata software, version 16, applying a significance level of <0.05 to establish statistical significance. Descriptive statistics were provided for participants' demographic data, sleep practices, scores on the Children's Sleep Habits Questionnaire (CSHQ) for children, as well as caregivers' sleep quality (PSQI score) and stress levels (T-PSS-10 score) in both groups. Independent t-tests were conducted to examine associations between children's sleep problems (CSHQ scores), caregivers' stress (T-PSS-10 scores), and sleep quality (PSQI scores). For categorical variables associated with scores exceeding the CSHQ cutoff (≥48), binary logistic regression was used to calculate coefficients and 95% confidence intervals (CI). This analysis investigated

the relationships between child sleep disturbances, caregiver sleep quality, caregiver stress, and other factors potentially influencing children's sleep. Finally, a backward stepwise multiple regression analysis was performed to identify the significant factors influencing children's total CSHQ scores.

RESULTS

Demographic data

A total of 202 participants were enrolled, comprising 87 children diagnosed with psychiatric disorders. The mean age of participants in the diagnosed group was 8.34 years, and it was 8.38 years for the control group. Males were predominant in children with psychiatric disorders. In the psychiatric diagnosed group, the majority of caregivers had a monthly income exceeding 50,000 baht, while in the control group, most caregivers had a monthly income below 20,000 baht. Among the diagnosed children, 64.37% were diagnosed with ADHD, and 82.76% of these children were prescribed medication. Most participants in both groups slept with others, such as parents or other family members. The sleep duration in the diagnosed children group was less than that in the control group. Children in the control group consume caffeine after 5 PM, engage in stimulating activities, and use screens 1 hour before sleep more frequently when compared to the diagnosed group (Table 1).

Children's Sleep Disturbances, Caregivers' sleep quality and stress levels in Diagnosed and Control Groups

Children in the diagnosed group exhibited a higher mean CSHQ total score (49.99, SD= 7.63) compared to the control group (47.82, SD=6.42), with a significance level of $P< 0.05$ (Table 2). The percentage of children with sleep disturbances in the clinically diagnosed group (57.47%) was significantly higher than in the controls (45.22%), based on scores equal to or greater than 48, which indicate the presence of sleep disturbances.[33] This trend was consistent across most CSHQ subscales, especially in bedtime resistance, sleep anxiety, and sleep-disordered breathing, where the differences were statistically significant.

The Thai version of PSQI revealing significantly higher total scores in caregivers of diagnosed children compared to controls: 7.83 (SD=4.07) and 6.23 (SD=3.88), respectively. Caregivers of children with psychiatric disorders exhibited a statistically significant higher percentage of poor sleep quality compared to the control group. The T-PSS-10 shows that most caregivers in both groups experienced moderate stress levels. However, caregiver stress did not show a statistically significant increase among caregivers of children in the psychiatric diagnosed group.

Correlated Factors with Sleep Disturbance in Children

The results reveal significant associations between sleep disturbances in children and psychiatric disorders, medication use, caregivers' sleep quality and stress levels. However, other factors, including sleep practices, show no association with children's sleep disturbances. (Table 3)

Stepwise multiple regression analysis for children's sleep disturbance

To identify predictors of sleep disturbance in school-age children, we analyzed selected factors including age, sex, sleep practices, presence of psychiatric diagnosis, medication use, caregiver's monthly income, screen time use, and sleep duration. The remaining significant predictors of the CSHQ total score were determined using stepwise linear regression, with a significance level set at <0.2. The resulting model accounted for 24.71% of the variance in overall sleep disturbance in the sample ($R^2 = 0.2471$, $p = 0.000$). (Table 4)

Among the identified predictors, the strongest contributor to an increased CSHQ total score was having a psychiatric diagnosis (B=5.32, p=0.000), followed by consuming caffeine after 5 PM (B=3.64, p=0.000), and caregiver stress levels (B=0.40, p=0.000). Conversely, the caregiver's monthly income was the only predictor associated with a decrease in the CSHQ total score (B= -2.15, p=0.008). (Table 4)

TABLE 1 Demographic data and sleep practices

	Children with psychiatric disorders (n=87)	Control children (n=115)	P-value
Age (mean, SD)	8.34 (1.41)	8.38 (1.46)	0.8537
Sex			0.000*
Male	67 (77.01%)	49 (42.61%)	
Primary caregiver			0.698
Mother	54 (62.07%)	77 (66.96%)	
Father	12 (13.79%)	18 (15.65%)	
Both Father and mother	11 (12.64%)	10 (8.70%)	
Other	10 (11.49%)	10 (8.70%)	
Income per month (baht)			0.000*
<=20,000	8 (9.19%)	72 (62.61%)	
20,001 - 50,000	39 (44.83%)	39 (33.91%)	
>=50,001	40 (45.98%)	4 (3.48%)	
Psychiatric disorder			
ASD	6 (6.90%)	-	
ADHD	56 (64.37%)	-	
Depression	2 (2.30%)	-	
Anxiety disorder	4 (4.60%)	-	
Others (e.g., ID, SLD, OCD)	19 (21.84%)	-	
Have medical underlying disease			
Allergic rhinitis	29 (33.33%)	10 (8.7%)	0.000*
Asthma	2 (2.30 %)	1 (0.87%)	0.406
Anemia	5 (5.75%)	2 (1.74%)	0.123
Epilepsy	3 (3.45%)	1 (0.87%)	0.193
Others (e.g., constipation, obesity)	16 (18.39%)	2 (1.74%)	0.000*
Use medication	72 (82.76%)	3 (2.61%)	0.000*
Stimulant	59 (67.82%)	0 (0.00%)	0.000*
Antipsychotic	19 (21.84%)	0 (0.00%)	0.000*
Antidepressant	9 (10.34%)	0 (0.00%)	0.000*
Antihistamine	8 (9.20%)	2 (1.74%)	0.016*
Have history of covid-19 infection	55 (63.22%)	62 (53.91%)	0.145
Screen time (min.) (Mean, SD)	164.68 (120.33)	203.22 (106.18)	0.0175*
Co-sleeping behavior	87 (100%)	113 (98.26%)	0.216
Sleep practice			
Bedtime			0.119
20:00 - 20:59	25 (28.74%)	21 (18.26%)	
21:00 - 21:59	32 (36.78%)	39 (33.91%)	
22:00 - 22:59	10 (11.50%)	25 (21.74%)	

TABLE 1 Demographic data and sleep practices (con.)

	Children with psychiatric disorders (n=87)	Control children (n=115)	P-value
Sleep duration (min.) (Mean, SD)	507.46 (47.77)	528.24 (78.35)	0.0496*
Wake-up time			0.018*
5:00 - 5:59	17 (19.54%)	8 (6.96%)	
6:00 - 6:59	38 (43.68%)	66 (57.39%)	
Sleep practice			
Drink caffeine after 5 PM	17 (19.54%)	50 (43.48%)	0.000*
Have a non-exciting bedtime routine	52 (59.77%)	57 (49.57%)	0.150
Have stimulating activity 1 hour before sleep	53 (60.92%)	92 (80.00%)	0.003*
Using screens 1 hour before sleep	62 (71.26%)	99 (86.09%)	0.009*
Bedroom is dark enough	83 (95.40%)	102 (88.70%)	0.089
Bedroom is quiet enough	82 (94.25%)	106 (92.17%)	0.565
Bedroom is comfortably cool	82 (94.25%)	107 (93.04%)	0.729
Using the bed for other purposes	36 (41.38%)	43 (37.39%)	0.565

Notes: *p-value <0.05

Abbreviations: ADHD, Attention Deficit Hyperactivity Disorder; ASD, Autism Spectrum Disorder; ID, Intellectual Disabilities; SLD, Specific Learning Disorder; OCD, Obsessive -Compulsive Disorder.

DISCUSSION

The children in the psychiatric diagnosed group exhibited notably both higher mean total scores on the CSHQ and a higher percentage of sleep disturbances compared to age-match controls. These findings were consistent with previous studies that reported a higher prevalence of sleep problems in children with mental health conditions.[16,38-40] Studies conducted in Thailand also demonstrated higher CSHQ total scores and a higher percentage of sleep disturbances in children with ADHD[20,21] and children with ASD.[18,41] When analyzing psychiatric disorders as a factor via stepwise regression, it was found that they are still significantly associated with children's sleep disturbance, leading to an increase in the CSHQ score.

The link between sleep disturbance in children and psychiatric disorders involves complex mechanisms. In ADHD, changes in brain structure and neurotransmitter imbalances significantly disrupt sleep cycles.[42,43] Beyond biological factors, problematic parent-child interactions further impact sleep habits. Additionally, ADHD symptoms like restlessness and disorganization perpetuate sleep challenges, while comorbidities such as Oppositional Defiant Disorder intensify these issues.[44] Children with ADHD and comorbid mood or anxiety disorders often suffer from frequent nocturnal awakenings and nightmares.[39] In Autism Spectrum Disorder (ASD), sleep difficulties arise from various factors, including genetic mutations, disrupted neurotransmitters, medical and psychiatric comorbidities, circadian sleep disturbances, and core features of ASD.[14,15] Similarly, in anxiety disorders, dysregulation of the hypothalamic-pituitary-adrenal axis severely disrupts sleep patterns. Anxious children often exhibit elevated cortisol levels before bed and heightened cognitive arousal at night, leading to significant sleep difficulties. Furthermore, severe mental health symptoms and multiple comorbid disorders are strongly linked to greater sleep disturbances. In a reciprocal relationship, insufficient or disturbed sleep may interfere with a child's ability to regulate emotions and behavior, potentially

TABLE 2 The Children's Sleep Habits Questionnaire (CSHQ) subscale and total scores, The Pittsburgh Sleep Quality Index (PSQI) and Thai Perceived Stress Scale-10 (T-PSS-10) in children with psychiatric disorders and Control children

	Children with psychiatric disorders (n=87)	Control children (n=115)	P-value
CSHQ score, Mean (SD)			
Bedtime resistance (6 items)	11.26 (2.51)	10.30 (2.01)	0.0029*
Sleep Onset Delay (1 item)	1.51 (0.71)	1.4 (0.65)	0.2721
Sleep Duration (3 items)	4.22 (1.65)	4.31 (1.25)	0.6429
Sleep Anxiety (4 items)	7.08 (2.11)	6.33 (1.87)	0.0082*
Night Wakings (3 items)	3.51 (0.93)	3.62 (0.85)	0.3761
Parasomnias (7 items)	8.37 (1.51)	8.25 (1.83)	0.6326
Sleep Disordered Breathing (3 items)	3.77 (1.02)	3.46 (0.80)	0.0165*
Daytime Sleepiness (8 items)	14.56 (3.26)	13.85 (3.01)	0.1102
CSHQ total score	49.99 (7.63)	47.82 (6.42)	0.0295*
Sleep disturbances (with cut-off point≥48), N (%)	50 (57.47%)	52 (45.22%)	0.022*
PSQI			
Total score	7.83 (4.07)	6.23 (3.88)	0.0052*
Poor sleep quality (With cut-off point>5), N (%)	57 (65.52%)	59 (51.30%)	0.043*
T-PSS-10			
Total score	17.07 (5.95)	16.93 (5.58)	0.8653
Stress severity Range, N (%)			0.934
low stress (0 - 13)	20 (22.99%)	29 (25.22%)	
moderate stress (14 - 26)	63 (72.41%)	81 (70.43%)	
high perceived stress (27 - 40)	4 (4.60%)	5 (4.35%)	

Notes: *p-value<0.05

Abbreviations: CSHQ, The Children's Sleep Habits Questionnaire; PSQI, The Pittsburgh Sleep Quality Index; T-PSS-10, Thai Perceived Stress Scale-10.

leading to mental health problems and disorders.[16] However, due to the small sample sizes in our study for each diagnosis, differences in sleep patterns and problems among these disorders could not be demonstrated. Additionally, this study does not assess the severity of symptoms and comorbidity. Further research is needed to gain more precise insights.

Previous studies link caffeine intake to shorter sleep duration, delayed sleep onset, increased wake after sleep onset (WASO), daytime sleep, and daytime sleepiness.[45] In children aged 8 to 12, caffeine is also associated with increased sleep problems and internalizing behavior symptoms.[46] In our study, no significant link was found between caffeine consumption after 5 PM and sleep disturbances when examined as a binary variable. However, after adjusting for confounding variables, a notable increase in the Children's Sleep Habits Questionnaire (CHSQ) score was observed, highlighting the impact of caffeine. Notably, 33.17% of children in the study, particularly those in the control group, consumed caffeine after 5 PM. This means that many caregivers may not be fully aware of the impact of consuming stimulants

before sleep, especially caffeine, which is widely acknowledged as a mild stimulant. Caffeine exerts its biological effects primarily by antagonizing adenosine receptors, notably A1 and A2A receptors. These receptors play pivotal roles in regulating sleep, arousal, and cognition across various brain regions.[47] Naturally occurring in tea, coffee, and chocolate, caffeine also finds its way into countless products such as soft drinks, energy

TABLE 3 Comparison of Factors and Sleep Disturbances in Children using Binary logistic regression

	Child with sleep disturbances (score≥48) N=102	Child with non-sleep-disturbed (score<48) N=100	Coefficient (95% confidence interval)	P-value
Age, (yrs.) (Mean, SD)	8.28 (1.41)	8.45 (1.47)	-0.17 (-0.56 - 0.23)	0.414
Sex (Male)	62	54	-0.28 (-0.84 - 0.28)	0.330
Have medical underlying disease	35	26	0.40 (-0.21 - 1.00)	0.199
Have psychiatric disorder	52	35	0.66 (0.09 - 1.22)	0.022*
Medication Use	45	30	0.61 (0.03 - 1.19)	0.039*
Income per month (baht)			0.40 (-0.32 - 0.40)	0.828
≤20,000	42	38		
20,001 - 50,000	35	43		
≥50,001	25	19		
Have history of Covid-19 infection	60	57	0.07 (-0.48 - 0.63)	0.793
Screen time, min./day (Mean, SD)	191.47 (116.38)	182.12 (111.37)	9.34 (-22.43 - 41.12)	0.563
Sleep duration, min./day (Mean, SD)	514.84 (80.24)	523.81(63.97)	-8.97 (-29.67 - 11.73)	0.393
Sleep practice				
Drink caffeine after 5 PM	37	30	0.28 (0.74 - 2.39)	0.344
Have a non-exciting bedtime routine	55	55	-0.04 (-0.60 - 0.51)	0.878
Have stimulating activity 1 hour before sleep	74	71	0.76 (-0.54 - 0.69)	0.807
Using screens 1 hour before sleep	83	78	0.21 (-0.48 - 0.90)	0.552
Bedroom is dark enough	94	92	0.02 (-1.00 -1.04)	0.967
Bedroom is quiet enough	94	94	-0.29 (-1.38 - 0.81)	0.607
Bedroom is comfortably cool	93	96	-0.84 (-2.05 - 0.37)	0.173
Using the bed for other purposes	43	36	0.56 (-0.31 - 0.83)	0.370
Caregiver's sleep quality				
PSQI Total score (Mean, SD)	7.88 (4.15)	5.94 (3.68)	1.94 (0.85 - 3.03)	0.001*
Caregiver's poor sleep quality	68	48	0.77 (0.20 - 1.34)	0.008*
Caregiver's stress				
T-PSS-10 score (Mean, SD)	18.58 (5.37)	15.37 (5.65)	3.21 (1.68 - 4.74)	0.000*
Caregiver's perceived stress moderate to high level	88	65	1.04 (0.43 - 1.65)	0.001*

Notes: *p-value<0.05

Abbreviations: ADHD, Attention Deficit Hyperactivity Disorder; ASD, Autism Spectrum Disorder; PSQI, The Pittsburgh Sleep Quality Index; T-PSS-10, Thai Perceived Stress Scale-10.

TABLE 4 Stepwise Multiple Regression Analysis of Factors Influencing Children's Sleep Habits Questionnaire (CSHQ) Total Scores

	Coefficient (B)	Standard Error (SE)	95% confidence interval	T-value	P-value
Have psychiatric disorder	5.32	1.26	2.84 - 7.80	4.24	0.000*
Drink caffeine after 5 PM	3.64	1.02	1.63 - 5.66	3.57	0.000*
T-PSS-10 score (caregiver's stress)	0.37	0.08	0.22 - 0.53	4.70	0.000*
Income per month	-2.15	0.80	-3.74 - -0.57	-2.68	0.008*
Constant	42.87	2.68	40.58 - 51.15	17.15	0.000*
R^2=0.2471 Adjusted R^2 =0.2284 F=13.21 Root MSE=6.02					

Notes: * p-value <0.05; Variables (age, sex, have psychiatric disorder, Sleep duration, Screen time, Sleep practice, T-PSS-10 score, PSQI Total score, use medication, Income per month, and have medical underlying disease) were entered to the model for stepwise linear regression analyses. Criteria for Sequential removal of predictors with p-values≥ 0.2.

Abbreviations: T-PSS-10, Thai Perceived Stress Scale-10.

drinks, and medications, making it easily accessible, even to children.[48] Caregivers should be especially cautious about caffeine intake, ensuring it's avoided for several hours before bedtime, and closely monitoring children's caffeine consumption.[49]

In this study, the mean children's sleep time was not significantly correlated with sleep disturbances. However, in both groups, the average sleeping hours are still falling below the recommended duration by the American Academy of Sleep Medicine. According to their guidelines, children aged 6 to 12 years should sleep for 9 to 12 hours (540 - 720 minutes) per day on a regular basis to improve attention, behavior, learning, memory, emotional regulation, quality of life, and mental and physical health.[50] Promoting optimal sleep time is essential for children in both groups.

Caregivers of children with psychiatric disorders in this study had significantly higher PSQI total scores, indicating poorer sleep quality. Within the diagnosed group, 65.52% of caregivers experienced poor sleep quality, surpassing rates in the control group. These findings align with previous studies linking sleep problems in children with psychiatric disorders to disruptions in parental sleep. For instance, mothers of children with developmental disabilities reported a mean PSQI global score of 7.90, with 61.5% reporting poor sleep quality.[51] Similarly, 86.6% of parents of children with ASD reported poor sleep quality.[52] Objective measures, like actigraphy, found that parents of children with ASDs slept 1 hour less than parents of typically developing children.[53]

In both groups, children with sleep disturbances had caregivers with significantly higher PSQI global scores (7.88 points vs. 5.94 points). Poor sleep quality in caregivers showed a significantly positive association with children experiencing sleep disturbances. This underscores significant connections between child's sleep and the caregiver's sleep, suggesting that daily variations in a child's sleep correlate with those in the caregiver's sleep. These connections may result from hereditary factors, parental modeling of sleep behaviors, assistance in managing the child's sleep, physiological conditions, and the overall family environment.[54,55] Some studies suggest that genes directly influence sleep quality, affecting traits such as duration, insomnia, and chronotype. The interaction between children's sleep duration and the 5-HTTLPR genotype impacts early-life behavioral scores.

However, our understanding of how genetics and environmental factors interact in phenotype manifestation remains incomplete. Caregivers wield significant influence over their children's sleep habits, with a reciprocal effect. Their actions, encompassing behavior management, screen time regulation, and sleep routines, notably affect sleep initiation and maintenance, particularly in young children. Additionally, parental medical and mental health conditions may influence children's sleep quality. Negative behaviors, such as abuse and frequent conflict, can precipitate emotional disturbances in children, thereby compromising their sleep quality.[49] Therefore, we must interpret these results cautiously, as another study suggests that parents with poor sleep quality tend to overreport sleep problems in their children.[56] While poor caregiver sleep quality initially showed a significant association with sleep disturbances in children, adjusting for confounding variables revealed no significant association. This underscores that while caregiver sleep quality may be linked to child sleep disturbances, other factors exert a more pronounced influence on determining sleep disturbances in children.

Even after considering other factors, the association between caregiver stress and CSHQ scores remains significant, highlighting its impact on children's sleep disturbances. Caregivers dealing with children's sleep disruptions tend to have slightly higher T-PSS-10 scores (mean score: 18.58) compared to those without sleep disturbances (mean score: 15.37), indicating elevated stress levels. This finding aligns with recent studies indicating that children and adolescents with sleep disorders can heighten parental stress levels and parental psychological distress[57-60] and increase the risk of depression in mothers.[22] Parenting stress can lead to parental burnout, which includes feelings of wanting to escape, thoughts of suicide, neglect, or even violence toward children[61] and correlates with adverse outcomes for both children and families, leading to adjustment issues, ineffective parenting, and lower-quality parent-child interactions characterized by diminished parental efficacy, perspective-taking, responsiveness, and engagement. Elevated parental psychological distress is also associated with a greater risk of internalizing and externalizing disorders in adolescent offspring, often coinciding with sleep disturbances. It's important to keep a close eye on caregiver stress, especially when children have trouble sleeping. There are many things that can add to caregiver stress, like a messy home, too many things to do, dealing with naughty behavior from children, going through tough times, and not having enough support from others.[25] It's crucial to understand and handle these challenges to protect the well-being of caregivers and children.

Interestingly, after adjusting for several factors that could influence children's sleep disturbances, the caregiver's monthly income emerged as the sole significant factor negatively associated with the CSHQ total score. This suggests that higher monthly income correlates with lower scores, in alignment with previous research indicating a direct link between higher parental income and reduced childhood sleep problems.[62] The socioeconomic status (SES) of families can impact various factors contributing to sleep problems in children, including knowledge about good sleep hygiene, the bedroom environment, family functioning, and family stress levels.[62] Parents with better sleep knowledge, higher socioeconomic status, and higher education levels tend to report earlier bedtimes, earlier wake times, and a more consistent sleep routine for their children, indicative of better sleep quality.[49,63] Understanding of adequate sleep duration and factors affecting sleep quality may differ across socioeconomic groups.[62,64,65] Children from lower SES backgrounds often encounter more disruptive sleep conditions (experience sleep disturbance), such as shared bedrooms, televisions in bedrooms, noise disturbances, temperature fluctuations, and discomfort while sleeping.[62,66,67] Moreover, family chaos characterized by household conflict and a lack of routine in family life is prevalent among lower SES families and correlates with child sleep problems.[62,68] Furthermore, SES impacts parents' psychosocial strains, including food and housing insecurity and mental health issues, which can hinder their

ability to engage in effective parenting strategies aimed at promoting sleep wellness, such as bedtime routines.[62,69]

While our study represents the first investigation in Thailand to explore the association between caregivers' sleep quality and stress levels concerning children diagnosed with psychiatric disorders or exposed to sleep disturbances, there are several limitations to consider. First, we relied solely on subjective reports, which may not fully capture sleep issues. Secondly, the sample distribution needs improvement for representativeness; data collection from a single hospital resulted in limited insights into specific psychiatric diagnoses, underlying medical conditions, and medications. Moreover, our study did not collect data on disease severity, medication effects, and side effects, hindering our ability to investigate their association with child sleep disturbance. Finally, the control group, recruited from one school, might not reflect the broader community due to its limited size and potential selection bias. Additionally, relying solely on self-reported surveys to rule out psychiatric disorders could have overlooked some cases, further limiting our ability to detect differences in sleep patterns between groups.

For future research, employing objective measures such as actigraphy or polysomnography to assess sleep problems would yield more accurate data. Conducting more extensive and diverse studies across various settings and recruiting more samples from multiple community and hospital settings may be necessary to enhance the generalizability of findings. Exploring interventions targeting sleep quality and caregiver stress, including education on sleep hygiene and stress management, could be fruitful. Longitudinal studies tracking sleep disturbances and caregiver stress over time could provide valuable insights, and investigating the bidirectional relationship between caregiver stress and children's sleep, along with potential mediators and moderators, would deepen our understanding.

CONCLUSION

In summary, our study highlights the heightened risk of sleep disturbances among children with psychiatric disorders. However, it's crucial to recognize that various factors beyond psychiatric conditions influence children's sleep. These factors include habits such as consuming caffeine after 5 PM, caregiver stress, and monthly income. Therefore, screening for and addressing sleep problems in all children is essential, regardless of psychiatric status. Additionally, caregivers responsible for these children should prioritize evaluating and managing their sleep quality and stress levels. Implementing universal interventions to enhance sleep quality, such as education on sleep hygiene and stress management, is vital for caregivers and children under their care.

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Conflict of interest

The authors declare no conflicts of interest regarding this observational study. No financial support or other benefits from commercial sources were received for the work reported in this manuscript.

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