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Sleep Disorders and Related Factors in Children 4-5 Years Old

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ABSTRACT

Introduction: Sleep disorders are common among children and can significantly impact their cognitive development, behavior, physical health, and mental well-being. The causes of sleep disorders in children are multifaceted, encompassing biological, behavioral, and psychomedical factors. While numerous studies have explored the prevalence of sleep disorders in school-aged children and adolescents, studies focusing on younger children remain limited.
Methods: This analytical descriptive study aimed to identify factors associated with sleep disorders in children aged 4–5 years. The study was conducted from April to September 2024 in kindergartens across Padang. The sample size was determined using the proportion estimation formula with absolute precision. Data collection involved obtaining medical histories from parents and conducting physical examinations of the children. Sleep disorders were assessed using a modified version of the Sleep Disturbance Scale for Children (SDSC). Statistical analysis was performed using the chi-square test, and logistic regression was applied for significance testing.
Results: The prevalence of sleep disorders in this study was 58.5%, with sleep initiation disorder being the most common type (30.9%). The most significant contributing factor to sleep disorders in children aged 4–5 years in Padang was bed arrangement, with an odds ratio of 1.65 (95% CI: 1.09–2.73).
Conclusion: Sleep disorders are prevalent among 4–5-year-old children in Padang and are primarily associated with bed arrangement issues. Addressing these factors may help improve sleep quality in young children.

Keywords: sleep disorder, children, SDSC, risk factor

INTRODUCTION

Sleep is a state of unconsciousness that can be interrupted by sensory stimuli and is influenced by both its quantity and quality.[1,2] Sleep disorders in children are a widespread issue, with a global prevalence ranging from 35% to 46%.[3,4] The number of sleep disorders in children with Autism Spectrum Disorder (ASD) is higher, reaching 60% in Indonesia and 16% in Japan.[5] Studies in Indonesia have reported that the prevalence of sleep disorders among children under three years old is 44.2%, while in children aged 4–6 years, it reaches 36.25%.[6,7]

Several factors contribute to sleep disorders in children, including biological, behavioral, environmental, socioeconomic, and interpersonal factors.[8–12] Children with a history of allergies, such as atopic dermatitis and allergic rhinitis, are at a significantly higher risk of experiencing sleep disorders,

with prevalence rates ranging from 60% to 88% across various allergic conditions.[13–15] Early detection of sleep disorders is crucial in preventing long-term consequences such as hormonal imbalances, metabolic disorders, learning difficulties, and psychosocial issues. [13–15]

While polysomnography (PSG) is the gold standard for objectively assessing sleep quality, its accessibility is limited.[18] As an alternative, various validated questionnaires are available for evaluating sleep disorders in children. The Sleep Disturbance Scale for Children (SDSC) is a widely used tool that assesses sleep disturbances over six months and can be applied to both preschool- and school-aged children.[19]

Sleep disorders in children can lead to various developmental and health issues, including cognitive impairment, anxiety, and depression. Therefore, interventions such as parental education, the implementation of sleep hygiene practices, and the management of risk factors are essential in improving children's sleep quality and preventing negative long-term outcomes.[3,4,8,9] This study aimed to analyze factors associated with sleep disorders in children aged 4–5 years.

MATERIALS & METHODS

This descriptive analytical study used a cross-sectional approach and was conducted in several kindergartens in Padang from April to October 2024. The study population included all kindergarten children in Padang, with a sample of 95 participants who met the inclusion and exclusion criteria. Participants were selected using multistage random sampling. Children aged 4–5 years whose parents provided informed consent were enrolled in the study. Exclusion criteria included children with neurological disorders (such as epilepsy, meningitis, meningoencephalitis, or cerebral palsy) and those taking medications that induce drowsiness.

The dependent variable in this study was sleep disorder, assessed using the SDSC questionnaire. Children with an SDSC score greater than 39 were classified as having sleep disturbances. The independent variables included child characteristics (age, gender, and nutritional status), history of allergies (asthma, eczema, urticaria, and rhinitis), and sleep habits (sleep patterns and activities before bedtime).

Data Collection and Statistical Analysis

Data were collected through parent interviews and anthropometric measurements using digital scales, microtoises, and measuring tapes. Statistical analysis was conducted using Statistical Package for the Social Sciences (SPSS), with results presented in tables. Univariate analysis was used to determine the frequency distribution and percentage of variables. Bivariate analysis was conducted using the Chi-square test to assess the association between risk factors and sleep disorders, with statistical significance set at $p < 0.05$. Multivariate analysis was performed using multiple logistic regression with the 'Enter' method to identify the most influential factors associated with sleep disorders based on the odds ratio (OR). This study was approved by the Ethics Committee of Dr. M. Djamil Padang General Hospital. Informed consent was obtained from the parents of all participating children before the study commenced.

RESULT

The results showed that the mean age of the participants was 4.61±0.30 years, with slightly more than half being female (50.4%). Most children had a normal nutritional status (83.7%) (see Table 1).

Table 1. Characteristics of Participants

Characteristics	n (%)
Age (years) (mean ± SD)	4.61±0.30
Gender	
Male	61 (49.6)
Female	62 (50.4)
Nutritional status	
Normal	103 (83.7)
Wasted	6 (4.9)

The prevalence of sleep disorders among children in this study was 58.5%. The most common type of sleep disorder was sleep initiation disorder (30.9%), followed by hyperhidrosis (26.8%), disorder of the sleep-wake schedule (23.6%), hypersomnia (13.8%), obstructive sleep apnea (8.1%), and somnolence (4.1%) (see Table 2).

Table 2. Overview of Sleep Disorder in Children Aged 4-5 Years

Sleep Disorder	n (%)
Absent	51 (41.5)
Present	72 (58.5)
Sleep initiation disorder (Z73.810)	38 (30.9)
Obstructive sleep apnea (G47.33)	10 (8.1)
Somnolence (R40.0)	5 (4.1)
Disorder of sleep-wake schedule (G47.2)	29 (23.6)
Hypersomnia (R40.07)	17 (13.8)
Hyperhidrosis (night sweat) (R61.9)	33 (26.8)

Table 3 showed that bed arrangement and sleep characteristics were significantly associated with sleep disturbances in children aged 4–5 years ($p < 0.05$) (see Table 3).

Table 3. Relationship between Risk Factors and Sleep Disorders in Children Aged 4-5 Years

Characteristics	Sleep disorder (n=72)	Non-sleep disorder (n= 51)	p-value	OR (95% CI)
Age (years), mean±SD	4.65±0.29	4.56±0.31	0.105†a	2.68 (0.81-8.86)
Gender, n (%)			0.165†b	
Male	40 (65.6)	21 (34.4)		1.79 (0.86-3.69)
Female	32 (51.6)	30 (48.4)		1
Nutritional status, n (%)			0.338c	
Normal	62 (60.2)	41 (39.8)		1
Wasted	4 (66.7)	2 (33.3)		0.76 (0.13-4.32)
Overweight	1 (20.0)	4 (80.0)		0.13 (0.09-1.99)
Obesity	5 (55.6)	4 (44.4)		0.63 (0.07-5.35)
History of atopy in children, n (%)			0.207†b	
Present	11 (78.6)	3 (21.4)		2.78
Absent	58 (56.9)	44 (43.1)		
Sleep Characteristics				
Bed arrangements, n (%)			0.048*†c	
Separated bedroom	15 (55.6)	12 (44.4)		1
Sharing a bedroom with parents, separated bed	25 (48.1)	27 (51.9)		0.74 (0.29-1.89)
Sharing a bed with parents	32 (72.7)	12 (27.3)		2.13 (1.78-5.85)
Sleep hygiene, n (%)			1.000b	
Present	63 (58.3)	45 (41.7)		0.93
Absent	9 (60.0)	6 (40.0)		

***, P<0.05 significant**
†, P<0.25 multivariate candidate variable
Ref, reference (not a risk factor)
Independent sample t- test
b. Chi-square
c. Cross-tabulation with Pearson Chi-square

Candidate variables from the bivariate analysis that met the criteria for multivariate analysis ($p < 0.25$) included age, gender, history of atopy, and bed arrangement. Multivariate analysis identified bed arrangement as the most influential factor associated with sleep disorders, with an OR of 1.56 (95% CI: 1.09–2.73) (see Table 4).

Table 4. The Most Influential Factor associated with Sleep Disorder

Variable	ß	S.E	p-value	OR (95% CI)
Age	1.00	0.66	0.131	2.72 (0.74-9.94)
Gender	-0.62	0.39	0.117	0.54 (0.25-1.17)
History of atopy in children	-0.789	0.70	0.259	0.45 (0.12-1.79)
Bed arrangements	0.50	0.26	0.048*d	1.56 (1.06-4.03)

d. Logistic binary regression test
****, significant (P<0.05)***

DISCUSSION

Characteristics of Participants

This study included subjects with a mean age of 4.61 ± 0.30 years, with slightly more than half being female (50.4%). These findings are consistent with previous studies by Williamson et al. and Dreier et al. However, they differ from those of Alfakeh et al. and Narasimhan et al., where the majority of participants were male and of an older age group. These differences are likely due to variations in the study populations.[3,20–22]

Most subjects in this study had a normal nutritional status (83.7%), similar to the findings of Guo et al. and Matsuoka et al., who reported a normal BMI in most participants.[23,24] However, these results contrast with studies by Elizabeth et al. and Zarpellon et al., which found a higher prevalence of overweight and obesity.[25,26] Differences in dietary intake and physical activity levels may have contributed to these variations.[3]

Overview of Sleep Disorder in Children Aged 4-5 Years

Sleep disorders are common in children, with prevalence rates ranging from 10% to 28%. Epidemiological studies have shown that up to 50% of children experience sleep disturbances, while 4% receive a formal diagnosis.[3,7,27] In this study, 58.5% of participants had sleep disorders, a finding similar to that of Dreier et al., who reported a prevalence of 45.7%.[21] However, this rate is notably higher than those observed in studies by Narasimhan et al. (34%), Ozgoli et al. (36.25%), and Gao et al. (14.29%).[3,7,27] The variation in prevalence may be attributed to differences in study populations. Narasimhan et al. included only children over 5 years old, whereas their study also showed that 17.8% of children at 20 months and 15.5% at 56 months experienced sleep disorders. Additionally, about 8% of children with regulatory disorders, including eating and sleeping difficulties, continued to experience symptoms until preschool age.[3] Similarly, Gao et al. reported that 17% of cases occurred at age 3, increasing to 28.27% at age 4 and 28.8% at age 5.[27] These findings highlight the need for further research to understand the factors influencing sleep disorders across different age groups.

Sleep disorders are classified into six domains: disorders of initiating and maintaining sleep (DIS), sleep-disordered breathing (SDB), disorders of excessive somnolence (DOES), sleep-wake transition disorders, parasomnia (PAR), and sleep hyperhidrosis. DIS is associated with sleep delay and difficulty initiating sleep, as well as issues related to sleep duration, nighttime awakenings, difficulty returning to sleep, and nocturnal hyperkinesia. SDB includes symptoms such as snoring, breathing difficulties, and sleep apnea. DOES consists of symptoms related to excessive daytime sleepiness. PAR is characterized by arousal disorders (e.g., sleep terrors), nightmares, and sleep-wake transition disorders (e.g., sleep talking). Sleep hyperhidrosis refers to excessive sweating during sleep.[28]

In this study, the most common sleep disorder was sleep initiation disorder (30.9%), followed by sleep hyperhidrosis (26.8%), sleep-wake schedule disorder (23.6%), hypersomnia (13.8%), obstructive sleep apnea (8.1%), and somnolence (4.1%). These findings are somewhat similar to those of Diéguez-Pérez et al., who reported 69.4% of subjects experiencing DIS, 61.7%

with sleep-wake transition disorders, 48.5% with arousal disorders, 44.7% with sleep hyperhidrosis, 41.7% with hypersomnia, and 27.2% with SDB.[29] A study by Metbulut found different prevalence rates, reporting 6.2% of subjects with DIS, 19.3% with SBD, 66.9% with arousal disorders, 12.4% with sleep-wake transition disorders, 2.8% with excessive somnolence disorders, and 18.6% with sleep hyperhidrosis. The prevalence of sleep hyperhidrosis and snoring in this study was comparable to that reported by Narasimhan et al. (7.1% and 9.1%, respectively), but the prevalence of DIS differed significantly.[3,30] Meanwhile, a study by Fuca et al. found that SDB was the most common sleep disorder (35.2%), followed by arousal and sleep-wake transition disorders (19.7%), DIS (18.3%), and hypersomnia and hyperhidrosis (4.2%).[31]

Relationship between Risk Factors and Sleep Disorders in Children Aged 4-5 Years

No significant association was found between age and sleep disorders in this study (p = 0.105). However, several studies suggest that poor sleep habits established in infancy may increase the risk of sleep disorders in childhood. Older children (6–12 years old) tend to develop more structured sleep habits, which should be maintained properly to prevent a decline in sleep quality.[28,29]

Similarly, no significant difference was observed based on gender (p = 0.165), although some studies indicate that boys tend to have shorter sleep durations than girls.[32] There was also no significant relationship between nutritional status and sleep disorders (p = 0.338). However, previous study has shown that sleep deprivation can increase the risk of obesity by disrupting hormonal regulation (e.g., cortisol and insulin) and stimulating appetite.[25,26,33–35]

A small proportion of subjects in this study had a history of atopy, consistent with previous findings where allergic rhinitis was the most commonly reported atopic condition.[23,24,30,33] Allergic rhinitis can impact sleep quality by causing inflammation, nasal congestion, increased sleep latency, and SDB.[36]

Additionally, 30.1% of children had a TV in their room, and 28.5% used gadgets before bed. Exposure to blue light before sleep can disrupt circadian rhythms and suppress melatonin production, contributing to sleep disorders.(37) Environmental factors such as noise, diet, and screen exposure before bedtime further exacerbate sleep issues. Co-sleeping has also been linked to shorter sleep duration, frequent nighttime awakenings, and sleep-related anxiety.[3,5,15] indicates that establishing consistent bedtime routines can help reduce sleep disturbances in children.

This study identified bed arrangement as the primary factor contributing to sleep disorders in children aged 4–5 years in Padang (OR = 1.65, 95% CI 1.09–2.73). This finding differs slightly from the study by Gao et al., which found that difficulty adapting to a new environment was the main cause of sleep disturbances.[27]

Poor sleep hygiene habits, such as having electronics in the bedroom, inconsistent sleep schedules, and late bedtimes, significantly impact both sleep quality and duration. Several studies have shown that using electronic devices before bedtime leads to shorter sleep duration and delayed sleep onset.[14,20,27] Additionally, sharing a bedroom with a sibling or caregiver may contribute to sleep disturbances due to disrupted routines, increased exposure to electronic devices before bedtime, and an elevated risk of choking or strangulation.[6,13,38] Environmental factors, including exposure to ambient light and noise, also play a role in sleep disorders.[37] Light exposure before bedtime, particularly blue light from screens, can suppress melatonin production, disrupting circadian rhythms. Moreover, noise from traffic or other environmental sources has been associated with shorter sleep duration and poorer sleep quality. [20,24,39]

CONCLUSION

This study investigated the factors associated with sleep disorders in children aged 4–5 years in Padang using the SDSC questionnaire. The prevalence of sleep disorders was 58.5%, with DIS being the most common type. Examined factors included age, gender, nutritional status, history of atopy, and bed arrangement, with bed arrangement emerging as the most significant contributing factor. Early detection and parental education on risk factors are essential in preventing sleep disorders in children. Additionally, early intervention is crucial to mitigate long-term effects that may impact growth and development.

Declaration by Authors

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