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Relationship between Screen Time Duration and Sleep Quality in Children Aged 2–5 Years in Kupang

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ABSTRACT

Background: The use of digital devices (gadgets) among young children continues to increase. Recent data show that approximately 39.71% of young children in Indonesia use mobile phones. Excessive screen exposure (screen time) can suppress melatonin production by up to 99% and reduce sleep duration. In Indonesia, the prevalence of sleep disturbances among preschool children reaches 44.2%; however, research on the relationship between screen time and sleep quality in East Nusa Tenggara remains very limited.

Methods: This study employed a correlational analytic design with a cross-sectional approach. A total of 70 children aged 2–5 years from the service areas of Sikumana Primary Health Center and Tarus Primary Health Center were selected using consecutive sampling. The study instruments included a screen time duration questionnaire and the Indonesian version of the Children's Sleep Habits Questionnaire (CSHQ). Data were analyzed using the Chi-square test.

Results: In total, 52.9% of children had normal screen time duration (≤60 minutes/day) and 47.1% had excessive screen time (>60 minutes/day). Most participants (68.6%) had poor sleep quality based on CSHQ scores. Bivariate analysis demonstrated a statistically significant association between screen time duration and sleep quality among children aged 2–5 years ($p = 0.001$).

Conclusion: There is an association between screen time duration and sleep quality; excessive digital media use is related to poorer sleep quality in toddlers. Parents are advised to limit children's screen time according to recommendations to maintain healthy sleep.

KEYWORDS: early childhood, screen time duration, sleep quality, Kupang

INTRODUCTION

Technological advances in the modern era have brought about significant changes in lifestyle patterns, learning processes, and the way humans interact.[1] These changes have also been driven by the increasingly widespread use of digital devices (gadgets) such as smartphones, tablets, and computers.[1] The duration of children's exposure to digital device use is referred to as screen time.[2,3] According to the 2024 Early Childhood Profile released by Statistics Indonesia (Badan Pusat Statistik/BPS), mobile phone use and internet access among young children in Indonesia have shown a marked increase.[4] Increased exposure to digital devices in this age group raises concerns regarding potential impacts on child health, including sleep quality. Global reports indicate that the prevalence of sleep disturbances among preschool children ranges from 20% to 30%.[5] In Indonesia, sleep disturbances among preschool children have been reported to reach 44.2%, with commonly reported complaints including frequent night awakenings.[5]

Physiologically, blue light emitted from digital device screens can suppress melatonin production, a hormone involved in regulating circadian rhythms and the sleep process, with reported reductions reaching 69%–99%.[6,7] This decrease in melatonin is associated with increased sleep latency and reduced total sleep duration.[6] Several studies have also reported that each additional hour of screen use in children is associated with an average reduction in sleep duration of approximately 10–11 minutes.[8] Beyond hormonal mechanisms, exposure to stimulating and interactive media content may increase cognitive arousal, making it difficult for children to achieve a relaxed state before sleep.[8,9]

Sleep quality during the preschool years plays an essential role in growth and development, including brain maturation, emotional regulation, and physical growth influenced by growth hormone secretion.[6,10] Although studies examining the relationship

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between screen time and sleep quality have been widely published globally, evidence specifically reflecting the context of East Nusa Tenggara, particularly Kupang City, remains limited. Therefore, this study was conducted to evaluate the association between screen time duration and sleep quality among children aged 2–5 years in Kupang City. The findings are expected to provide an informational basis for communities and health practitioners in regulating digital media use to support healthy sleep in children.

METHODS

This study was a correlational analytic study with a cross-sectional design. Data collection was conducted in the service areas of Sikumana Primary Health Center and Tarus Primary Health Center, Kupang City, during June–July 2025. The study protocol was declared ethically eligible by the Research Ethics Committee of the Faculty of Medicine and Veterinary Medicine, Universitas Nusa Cendana, under approval letter number LB.02.03/1/0267/2025.

The study population comprised children aged 2–5 years and their parents residing in the study sites. Samples were recruited using consecutive sampling until the minimum of 70 eligible subjects meeting the inclusion and exclusion criteria was achieved. The inclusion criteria were children aged 2–5 years who had been exposed to screen time and parents who were willing to sign written informed consent. Children with special needs or a history of congenital sleep disorders were excluded.

Data were collected using two main instruments: a screen time duration questionnaire and the Children's Sleep Habits Questionnaire (CSHQ). The screen time questionnaire measured the daily duration children spent using screen-based media. Duration was then categorized as normal (≤60 minutes/day) and excessive (>60 minutes/day) based on WHO and the Indonesian Pediatric Society (IDAI) recommendations. The CSHQ was used to assess children's sleep quality based on parental reports. Sleep quality classification was determined using a total score cutoff of 41; scores ≤41 were categorized as good sleep quality, whereas scores >41 were categorized as poor sleep quality. Data collection was conducted directly at community health posts (posyandu), with researcher assistance provided while parents completed the questionnaires.

Data analysis was performed using computer software in two stages. Univariate analysis was used to describe the frequency distribution of participant characteristics and the variables of screen time duration and sleep quality. Bivariate analysis employed the Chi-square test to evaluate the association between screen time duration and sleep quality as categorical variables. Statistical significance was set at $p < 0.05$.

RESULT

This study involved 70 children aged 2–5 years and their parents as respondents from the service areas of Sikumana Primary Health Center and Tarus Primary Health Center, Kupang City. Most parent respondents were female (94.3%), and the most common highest education level was senior high school (45.7%). Among the child subjects, the proportion of girls was higher (57.1%) than boys (42.9%), and the largest age group was 36–47 months (35.7%). Detailed characteristics of respondents and subjects are presented in Table 1.

Table 1. Characteristics of Respondents (Parents) and Subjects (Children) (n = 70)

Characteristic	Category	n	%
Respondents (Parents)			
Sex	Female	66	94.3
	Male	4	5.7
Highest education level	Primary school	15	21.4
	Junior high school	13	18.6
	Senior high school	32	45.7
	Higher education (D3–S2)	10	14.3
Subjects (Children)			
Sex	Female	40	57.1

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Characteristic	Category	n	%
	Male	30	42.9
Age	24–35 months	24	34.3
	36–47 months	25	35.7
	48–59 months	17	24.3
	60 months	4	5.7

In the univariate analysis, most children had screen time duration within the normal category (≤60 minutes/day), totaling 37 children (52.9%), whereas 33 children (47.1%) were in the excessive category (>60 minutes/day). Based on the CSHQ assessment, 48 children (68.6%) were classified as having poor sleep quality (score >41), while 22 children (31.4%) had good sleep quality (score ≤41). The distribution of screen time duration and sleep quality is shown in Table 2.

Table 2. Distribution of Screen Time Duration and Children's Sleep Quality (n = 70)

Variable	Category	n	%
Screen time duration	Normal (≤60 minutes/day)	37	52.9
	Excessive (>60 minutes/day)	33	47.1
Sleep quality (CSHQ)	Good (≤41)	22	31.4
	Poor (>41)	48	68.6

The Chi-square test indicated a statistically significant association between screen time duration and sleep quality (p = 0.001). In the excessive screen time group, the proportion of poor sleep quality was higher (29/33; 87.9%) than in the normal duration group (19/37; 51.4%). The bivariate analysis is presented in Table 3.

Table 3. Association Between Screen Time Duration and Children's Sleep Quality (n = 70)

Screen time duration	Good sleep quality	Poor sleep quality	Total	p
Normal (≤60 minutes/day)	18	19	37	0.001
Excessive (>60 minutes/day)	4	29	33	
Total	**22**	**48**	**70**	

DISCUSSION

The Chi-square test yielded p = 0.001, indicating a statistically significant association between screen time duration and sleep quality among children aged 2–5 years in Kupang City. This finding suggests that longer screen time is associated with a higher proportion of poor sleep quality in children. These results are consistent with the literature identifying exposure to electronic devices as a factor associated with sleep disturbances in children. A systematic review by Carter et al. reported that electronic device use in children is associated with a higher risk of sleep problems, including shorter sleep duration and poorer sleep quality.[6] A study by Hablaini et al. in Indonesia likewise found that increased gadget use duration is closely associated with reduced sleep quality in children.[11]

In the present study, 33 of 70 children had screen time >60 minutes/day, and 29 of them experienced poor sleep quality. This is clinically relevant because sleep quality in early childhood plays a crucial role in physical growth and cognitive development. The American Academy of Sleep Medicine consensus statement emphasizes that adequate sleep duration contributes to learning, memory, and children's physical health.[10]

Physiologically, screen time–related sleep disruption can be explained by exposure to blue light from digital screens, which is perceived by the retina and influences the circadian timing system. Suppression of melatonin secretion, a biological marker of

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nighttime, may increase sleep latency and reduce sleep efficiency.[12,13] Nighttime light exposure has also been associated with changes in certain sleep parameters that are important for recovery and cognitive function.[12,13]

Beyond light effects, stimulating and interactive media content can increase children's cognitive and emotional arousal, making pre-sleep relaxation less optimal. Gomes and Goldman reported that each additional hour of screen time before bedtime in children may be associated with an average reduction in sleep duration of approximately 10–11 minutes.[8] Environmental factors such as a bright sleeping environment (48.6%) and noise (11.4%) may further worsen sleep quality by increasing stress responses that disrupt sleep continuity. Prior studies have also reported the impact of nighttime noise on children's sleep quality.[14,15]

Behavioral aspects, including inconsistent sleep routines, also contribute to children's sleep quality. Mindell and Williamson reported that regular bedtime routines are associated with longer sleep duration and fewer night awakenings.[16] In this study, the main reason parents provided digital media was to calm the child (n = 41), which may foster behavioral dependence and increase the risk of emotional reactivity when access is restricted.[17]

Overall, improving children's sleep quality requires a multifaceted approach that includes regulating screen time duration, avoiding device use close to bedtime, optimizing the sleep environment, and establishing consistent pre-sleep routines. Limiting screen time to a maximum of one hour per day in accordance with WHO and IDAI recommendations, and avoiding device use at least one hour before bedtime, are recommended strategies to support healthy sleep in children.[18,19]

CONCLUSION

Based on the findings regarding the association between screen time duration and sleep quality among children aged 2–5 years in Kupang City, most children had daily screen time within the normal category (≤60 minutes/day). However, the majority of subjects demonstrated poor sleep quality based on the Children's Sleep Habits Questionnaire (CSHQ). Bivariate analysis showed a statistically significant association between screen time duration and sleep quality (p = 0.001), wherein children with excessive screen time (>60 minutes/day) tended to have poorer sleep quality compared with children whose screen time was within the normal range.

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