

Digital media-based sleep hygiene education to improve knowledge and sleep quality of school-aged children

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ABSTRACT

Sleep is a fundamental biological need for children that is crucial for growth, emotional regulation, and cognitive function. However, sleep disturbances among school-aged children in Indonesia, including in Manado City, remain very high and are often unrecognized by parents due to a lack of health literacy regarding healthy sleep habits (sleep hygiene). This community service project aimed to increase children's knowledge about the importance of sleep and improve their sleep quality through appropriate education. Partners in this activity included students and elementary school staff in Manado City, with a total of 36 child respondents with a mean age of 10.12 years and a female majority (63.9%). The implementation method involved educational and participatory outreach utilizing digital media, including presentation slides, educational animated videos, and interactive Q&A sessions. Post-education monitoring was reinforced by engaging parents through a questionnaire to track children's sleep quality at home. Evaluation results using the Wilcoxon test demonstrated a significant increase in respondents' knowledge, with mean pre-test scores rising from 60.58 to 81.11 on the post-test ($p < 0.05$). This successful literacy improvement had a linear impact on enhancing children's sleep quality at home, where the mean sleep quality score significantly increased from 40.53 to 49.28 ($p < 0.001$). This digital-based sleep hygiene intervention proved effective as a health-promotive and preventive strategy to minimize childhood sleep disturbances, reduce the negative impact of nighttime gadget use, and support the optimization of their learning concentration at school.

Keywords: digital media; educational outreach; school-aged children; sleep hygiene; sleep quality.



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INTRODUCTION

Sleep is a fundamental biological need that is crucial for children's growth and development, particularly in supporting brain development, cognitive function, emotional regulation, and physical health. School-aged children generally require approximately 9–11 hours of sleep each night to achieve optimal development; however, various studies show that pediatric sleep disturbances are a prevalent health problem in many countries¹. A global meta-analysis indicated that approximately 34% of children and adolescents worldwide experience sleep disturbances². Another study revealed that about 59.5% of children experience general sleep disturbances, including bedtime resistance, sleep anxiety, and a sleep duration shorter than recommended for their age group³. This demonstrates that sleep disturbances represent a significant health issue among the pediatric population.

Research in Indonesia indicates that the prevalence of sleep disturbances in children remains quite high. A study reported a sleep disturbance prevalence of 25.1% among school-aged children in Jakarta⁴. A study conducted on Indonesian children showed that approximately 31% experience sleep problems, including nighttime sleep durations of less than 9 hours and frequent nocturnal awakenings⁵. Another study in Indonesia reported that nearly 66% of children experience sleep disturbances, such as frequent night awakenings or difficulty falling asleep⁶. Furthermore, research on elementary school students in Indonesia indicated that around 60% of children suffer from sleep disturbances that could potentially affect their learning activities and physical health⁷. These findings underscore that sleep disturbances are a pediatric health concern that warrants serious attention through educational and health-promotive efforts.

Issues regarding childhood sleep disturbances have also been documented in research conducted in Manado City. A study involving elementary school students in Manado City showed that approximately 62.7% of students at SD Negeri 36 Manado City experienced sleep disturbances based on measurements using the Sleep Disturbance Scale for Children (SDSC). This figure indicates that more than half of school-aged children suffer from sleep problems that could impact their daily activities and learning process⁸. Another study in Manado City revealed that 89.4% of children experienced sleep problems⁹. Research conducted by the team leader in 2025 on factors affecting child growth and development found that sleep disturbances are a key contributing factor, with approximately 56% of children in Manado City experiencing sleep issues¹⁰.

Sleep disturbances in children can manifest as difficulty initiating sleep, nighttime awakenings, short sleep duration, and daytime sleepiness¹¹. These high rates of sleep disturbances indicate that sleep problems among children in Indonesia remain widespread and are frequently unrecognized by parents, many of whom dismiss sleep issues as a normal developmental phase, leaving unhealthy habits unaddressed without intervention¹². However, poor sleep quality in children can adversely affect various developmental domains, including impaired learning concentration, behavioral issues, and reduced academic performance¹³. This highlights the need for serious attention from various stakeholders, including healthcare professionals, educators, and parents. Therefore, health-promotive efforts are required to enhance the knowledge of both children and parents regarding sleep hygiene the behavioral practices that support healthy sleep^{13,14}.

Sleep hygiene refers to behavioral practices that facilitate healthy sleep, including consistent sleep schedules, limiting caffeine and screen time, and creating a comfortable sleep environment¹³. Sleep hygiene education has been proven effective in enhancing sleep quality and attentional function in children and adolescents¹⁵. Sleep deprivation in children directly impacts attention deficits, impulsivity, and decreased academic performance^{16,17,18}. Consequently, sleep quality is not merely a health issue, but also an educational one. Previous efforts generally focused on conventional education using medical leaflets at public health centers; however, their effectiveness among school-aged children remains limited due to a lack of interactivity. In today's digital era, urban partner elementary schools

possess environmental potential in terms of high accessibility and children's rapid adaptation to technological devices, making the utilization of audio-visual and multimedia-based educational platforms a strategic opportunity for effective health promotion.

This community service initiative serves as a direct translational implementation of empirical research findings that identified a high correlation between sleep problems and the risk of developmental delays in children in Manado City. Based on this situation, the problem formulation for this community service project centers on addressing high rates of sleep disturbances and improving healthy sleep literacy among school-aged children through interactive educational approaches amidst heavy daily screen time exposure. Guided by this problem statement, this community service project aims to increase students' knowledge of sleep hygiene through digital media implementation and to evaluate actual improvements in children's sleep quality within the home environment through parental monitoring. Sleep hygiene education serves as a pivotal strategy in health promotion and prevention aimed at improving children's sleep quality. By providing appropriate education, children can understand the importance of adequate sleep and adopt healthy sleep habits in their daily lives¹⁹.

METHOD of IMPLEMENTATION

Time and Location

This community service project was conducted in July 2026. The intervention was centered at *SD Negeri 36 Manado City*, North Sulawesi Province, selected due to the high prevalence of sleep disturbances among students in the area. A total of 56 students participated in this activity.

Methodology

To achieve the goals of enhancing sleep hygiene literacy and improving student sleep quality, this initiative employed an educational and participatory approach utilizing digital multimedia. The execution stages were structured as follows:

1. **Preparation Phase:** Coordinating with partner school authorities, collecting secondary student data, mapping baseline complaints during learning activities via homeroom teacher interviews, and assessing children's baseline sleep quality by distributing questionnaires for parents/guardians to complete.
2. **Implementation Phase:** Prior to delivering the education, the team assessed students' baseline knowledge of sleep hygiene, followed by an intervention featuring live presentations on healthy sleep habits using digital media (visual slides and animated educational videos). This phase concluded with a participatory Q&A session, interactive discussions with students, and a post-education assessment of student sleep hygiene knowledge.
3. **Evaluation and Termination Phase:** Assessing immediate cognitive outcomes directly in the classroom and distributing child sleep quality questionnaires for home monitoring, completed by parents/guardians over a 2-week period post-intervention.

Outcome Measurement Instruments

The outcomes of the community service project were evaluated quantitatively and descriptively using two validated primary instruments:

1. **Cognitive Test Questionnaire (Pre-Test and Post-Test):** A descriptive measurement tool consisting of 10 multiple-choice questions covering core sleep hygiene principles (sleep schedules, caffeine limitation, and screen time impacts) to evaluate student knowledge levels before and after education.
2. **Child Sleep Quality Questionnaire:** A descriptive tool adapting a modified version of the standardized Sleep Disturbance Scale for Children (SDSC) developed by Bruni et al.²⁰ This questionnaire was validated in an Indonesian version by Natalita et al.²¹. The instrument consists

of a daily observation sheet using a 5-point Likert scale ranging from 1 (Never) to 5 (Always), which parents/guardians completed objectively at home.

Data Analysis

The program's success rate was analyzed using comparative non-parametric statistics via the Wilcoxon Signed-Rank Test. Success was evaluated based on significant gains in students' mean literacy scores. The activity was declared successful in driving adaptive behavioral changes if the Wilcoxon test yielded an Asymp. Sig. (2-tailed) value of < 0.05 , indicating a statistically significant increase in healthy sleep knowledge post-education. Furthermore, success indicators included significant improvements in post-intervention sleep quality scores ($p < 0.05$), positive behavioral shifts marked by reduced nighttime screen time before sleep, and decreased reports of daytime sleepiness or lethargy during school activities.

RESULT

Table 1. Participant characteristics (n = 56)

Characteristics	n (%)	Mean
Age of Child (years)		10.12
Gender		
Male	20 (35.72)	
Female	36 (64.28)	
Father's Occupation		
Formal Sector	34 (60.71)	
Informal Sector	22 (39.29)	
Mother's Occupation		
Housewife + Working	21 (37.50)	
Housewife	35 (62.50)	
Sleep Companion		
Parent/Guardian/Caregiver	28 (50.0)	
Independent Sleep (No Companion)	28 (50.0)	
Bedroom Ownership		
Own Bedroom	14 (25.00)	
Shared Bedroom	32 (57.14)	
Pre Bedtime Screen Time		
Yes	39 (69.64)	
No	17 (30.36)	

Source: Primary Data, 2026

Based on Table 1, participants had a mean age of 10.12 years, with the majority being female (64.28%). Regarding family background, most fathers worked in the formal sector (60.71%), while the majority of mothers were housewife (62.50%). Concerning daily sleep supervision patterns, the percentage of children accompanied by a parent/guardian/caregiver was equal to those who slept independently without a companion, each at 50.0%. However, in terms of physical facilities, 32 children (57.14%) still slept in a shared bedroom with other family members. The most crucial finding was identified in daily digital habits, where 39 children (69.64%) actively engaged in screen time activities (using electronic devices or watching television) in bed immediately before nighttime sleep.

Table 2. Pre- and post-test sleep hygiene literacy (n = 56)

Variable	Mean $\pm$ SD	Sig.(2-tailed)
Pre-test	60.58 $\pm$ 7.91	>0.001
Post- Test	81.11 $\pm$ 6.67	

Source: Primary Data, 2026

Based on Table 2, there was an increase in the participants' cognitive knowledge level. The children's mean baseline knowledge score before the intervention was 60.58 ± 7.91 , which increased to 81.11 ± 6.67 at the post-intervention evaluation. Comparative analysis using the Wilcoxon Signed-Rank Test and Asymp. Sig. (2-tailed) value of 0.000 ($p < 0.05$), demonstrating that digital media-based education (presentation slides and animated videos) had a statistically significant effect on improving sleep hygiene literacy among school-aged children.

Table 3. Pre- and post-intervention sleep quality in school-aged children (n = 56)

Variable	Mean $\pm$ SD	Sig.(2-tailed)
Children's Sleep Quality Before Education	40.53 $\pm$ 1.890	>0.001
Children's Sleep Quality After Education	49.28 $\pm$ 2.037	

Source: Primary Data, 2026

Data in Table 3 illustrates the difference in children's sleep quality at home before and after program implementation. The children's mean sleep quality score demonstrated a quantitative improvement, increasing from a baseline of 40.53 ± 1.890 to 49.28 ± 2.037 following post-education monitoring. Comparative statistical testing showed a significance value of Sig. (2-tailed) < 0.001 ($p < 0.05$). This indicates that the literacy gains achieved at school successfully translated into tangible behavioral changes at home. The digital education approach, supported by a parental monitoring system, proved significantly effective in improving children's daily sleep quality and minimizing the prevalence of nighttime sleep disturbances.



Figure 1: Education participants



Figure 2: Pre Test



Figure 3: Educational media correctly



Figure 4: Participants who answered correctly

DISCUSSION

This community service project focusing on digital media-based sleep hygiene education demonstrated highly positive outcomes in increasing knowledge and improving sleep quality among school-aged children. Respondent characteristics in this initiative showed a mean age of 10.12 years, with a female majority (63.9%). At this age, children are in a crucial transitional phase of cognitive and physical development, where the ideal sleep duration ranges from 9 to 11 hours per night to support optimal brain function²¹.

One notable finding regarding the baseline characteristics of respondents was the high rate of pre-bedtime screen time, reaching 69.4%. This aligns with the challenges of the digital era, where children frequently use electronic devices (gadgets) leading up to bedtime. Exposure to blue light from device screens is scientifically proven to suppress the production of the hormone melatonin, which regulates sleep cycles, thereby triggering bedtime resistance and delaying sleep onset^{22, 23}. Furthermore, environmental factors such as bedroom arrangements revealed that 58.3% of children still shared a bedroom. Shared room conditions potentially increase noise or light distractions from other family members, which can disrupt children's sleep continuity at night²⁴.

Impact of Education on Sleep Hygiene Literacy

The analysis showed a significant increase in knowledge regarding sleep hygiene following the educational intervention. Participants' mean pre-test score of 60.58 increased to 81.11 on the post-test. Based on the Wilcoxon statistical test, and Asymp. Sig. (2-tailed) value of 0.000 ($p < 0.05$) was obtained, confirming that the delivery of digital media-based education (slides and educational videos) had a statistically significant effect on respondents' literacy levels.

This substantial increase in knowledge proves that educational and participatory outreach methods using audio-visual media are highly effective for school-aged children. Digital media can visualize abstract concepts of healthy sleep habits such as caffeine limitation, consistent sleep scheduling, and screen time reduction into engaging and easily understandable information for children^{24, 25}. A solid understanding of the importance of sleep serves as a crucial foundation for children to independently begin modifying their daily sleep behaviors.

Improvement in Children's Sleep Quality

The successful increase in literacy had a linear impact on improving children's sleep quality at home. Based on questionnaire reports completed by parents, there was a distinct difference in children's sleep quality before and after the intervention. The mean sleep quality score increased from 40.53 to

49.28 with a significance level of $p < 0.001$. This improvement in sleep quality indicates that children not only absorbed information during the educational sessions but were also able to apply it in their daily lives with parental support at home. Engaging parents through home questionnaire tracking proved to be an effective monitoring strategy. When children reduce pre-bedtime screen time and begin implementing consistent sleep schedules according to sleep hygiene principles, sleep disturbances such as frequent night awakenings or difficulty initiating sleep can be minimized²⁵. Given that sleep deprivation directly impacts learning concentration, emotional regulation, and academic performance at school, this sleep hygiene intervention plays a highly strategic preventive role not only in the health sector but also in the education sector.

CONCLUSION

Overall, the digital media-based sleep hygiene education program demonstrated positive results in enhancing knowledge and encouraging sleep behavior changes among school-aged children. The use of interactive audio-visual media helped children understand the importance of healthy sleep and adopt better sleep habits in their daily lives. This is reflected in the improvement in children's sleep quality following the intervention. Although the program achieved its designated goals, several limitations were encountered during implementation. The limited post-education monitoring period prevented long-term behavioral changes from being evaluated. Furthermore, home environmental conditions such as children sharing a bedroom with family members and high nighttime gadget use present ongoing challenges to establishing healthy sleep habits. Therefore, consistent parental involvement and supervision are necessary to sustain positive changes in children's sleep behaviors.

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Conflict Of Interest

The author(s) declared no potential conflicts

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