Impact Of Sleep Disorder On Quality Of Life In Epileptic Children

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Abstract
Background: The widespread childhood neurological condition epilepsy generates sleep disturbances that negatively affect quality of life (QOL). The relationship between sleep patterns and QOL in epileptic children needs more research despite its recognized significance.
Methods: The research examined 51 children between 4 and 11 years old with epilepsy through a cross-sectional study. The study used the Children's Sleep Health Questionnaire (CSHQ) to measure sleep behaviors and assessed quality of life (QOL) through the QOLCE-55.
Results: The CHSQ scores averaged 15.5 ± 5.7 while QOL scores measured 70.17 ± 12. QOL showed a negative correlation with sleep disturbances at -0.858 with $p < 0.001$ significance. Sleep behavior problems created the largest impact on all four QOL domains. Regression analysis results proved QOL functions as a substantial predictor for CHSQ ($\beta = -0.85$, $p < 0.001$).
Conclusion: Sleep disturbances cause substantial deterioration of quality of life among children who have epilepsy. Application of Cognitive Behavioral Therapy for Insomnia (CBT-I) and sleep hygiene education could effectively treat sleep disorders, which also enhances both total health status and seizure care management**.**

Keywords: Epilepsy, sleep disturbances, quality of life, children, behavioral problems

Introduction

One of the most common forms of childhood neurological disorders is epilepsy, and over 10 million children are affected by it worldwide. Sleep disturbances are one of the most common conditions that coexist with it (Kansra et al., 2021). Sleep disorders occur in 45–95% of children with epilepsy, much higher than the 25–40% seen in typically developing children. They include irregular sleep-wake cycles, frequent night awakenings, excessive daytime sleepiness, and problems with maintaining sleep (Khalil et al., 2022). These sleep issues (Al-Najjar et al., 2023) are due to seizure activity, anti-epileptic drugs (AEDs), and neurological dysfunctions. Sleep problems generate cognitive, emotional and behavioral consequences, which medical professionals frequently fail to diagnose and treat properly (Ekinci et al., 2017). Research on the relationship between sleep disorders and QOL in epileptic children remains scarce (Hussain et al., 2020). Epilepsy-related sleep quality promotes higher seizure occurrence while simultaneously harming emotional and social as well as cognitive capabilities and influencing epilepsy treatment strategies (Dehghani et al., 2019). The research aims to bridge this knowledge gap through an investigation of sleep disturbances and QOL in children with epilepsy and their corresponding associations as well as the identification of major influencing factors.

Materials and Methods

Type of Study

A one-time research design investigated sleep disorders and quality of life among children with epilepsy. The study obtained information at a single point in time to analyze both sleep measurements and quality of life scores for its selected participant group. Researchers employed a single-time analysis to determine the sleep disturbance effects on emotional, cognitive, social, and physical aspects of quality of life in epileptic children.

Time of Study

The researchers conducted the study over eight months, spanning from November 2023 to June 2024. The hospital's specific medical units served as the venue for data collection through routine patient visits. The research period allowed investigators to gather data about children's sleep patterns and seizure occurrences together with quality-of-life measurements.

Place of Study

The research took place in three pediatric units located at Calcutta National Medical College & Hospital (CNMCH). The main location for child epilepsy recruitment with neurological assessment took place at the

Pediatric Neurology Clinic. Children who received routine follow-up care visited the Pediatric Outpatient Department (OPD), and inpatient treatment for epilepsy took place within the Pediatric Ward.

Sample Size and Technique
The research included 51 children who had epilepsy. The research adopted convenience sampling as the participant selection method, which relied on available and willing participants. The convenience sampling technique allowed for study feasibility yet increased the potential for selection bias to occur.

Inclusion Criteria
The research team recruited epilepsy patients together with their caregivers from three locations at CNMCH, the neurological clinic, the outpatient department, and the inpatient ward. The research study examined children who were between 4 and 11 years old during both the early childhood and the middle childhood stages. The participants met the International League Against Epilepsy (ILAE) 2017 criteria for epilepsy diagnosis. During the research period, the study obtained sleep habits and quality of life data from children with eligible conditions and their consenting caregivers.

Exclusion Criteria
Children who were born earlier than 37 weeks of gestation did not participate because prematurity affects both sleep patterns and neurodevelopment. The study excluded participants who displayed clear signs of brain damage together with cerebral palsy. Children with hematologic tumors, together with congenital heart diseases, ADHD, autism spectrum disorder (ASD), tic disorder (TD), and any confirmed physical or psychiatric conditions, were excluded because these conditions affect sleep patterns and quality of life. The study excluded participants who did not speak Bengali because it would hinder communication effectiveness.

Tools of our Study
Children's Sleep Health Questionnaire

Category	**Usually (3)**	**Sometimes (2)**	**Rarely (1)**
Sleep Behaviour	It affected all four QOL domains the most	Occasional disturbances noted	Less frequent
Waking During Night	Second most affected	Frequently observed	Less common
Morning Waking	Some impact but lower than other categories	Occasional issues reported	Least reported
Daytime Sleepiness	Highly affected, strong correlation with poor QOL	Frequently noted	Less common

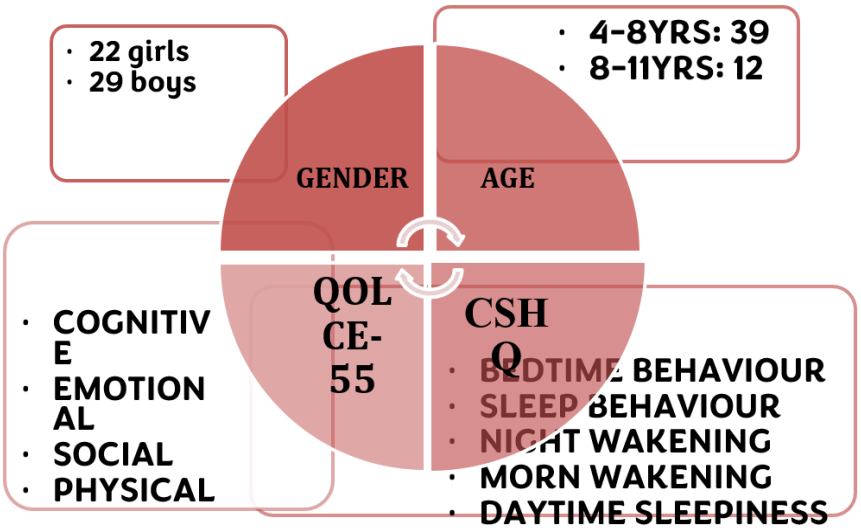
Quality of Life in Childhood Epilepsy Questionnaire: QOLCE - 55

PARAMETERS	***VERY OFTEN (0)***	***FAIRLY OFTEN (25)***	***SOMETIMES (50)***	***RARELY (75)***	***NEVER (100)***	***NOT APPLICABLE***
COGNITIVE (22)	*-*	*-*	*Moderate impact (Mean Score: 73.8 ± 11.4)*	*Frequently reported as stable*	*Least affected domain (Higher scores)*	*-*
EMOTIONAL (17)	*Frequently reported (Most affected)*	*Severe impact (Mean Score: 70.8 ± 12.2)*	*Occasionally affected*	*Rarely reported*	*Rarely*	*-*
SOCIAL (7)	*Occasionally impacted*	*Moderate effect*	*Sometimes noted*	*Rarely reported*	*Rarely*	*-*

PHYSICAL (9)	*Frequently affected*	*Considerable impact*	*Sometimes affected*	*Rarely reported*	*Rarely*	-

Source: Goodwin et al. (2015) and Ferro et al. (2016)

Study Variables



Data Analysis

The statistical analysis involved both descriptive and inferential statistics to process the gathered data through arrangement, coding, tabulation, analysis, categorization, and summarization. The descriptive statistics employed frequency distribution and percentage data alongside mean and standard deviation values, but the inferential statistics used t-tests, ANOVA, and Pearson correlation coefficients. The evaluation of quality of life and sleep habits for children with epilepsy was conducted through statistical analysis using SPSS version 27.

Results

Demographic Characteristics of Participants

The study included 51 children diagnosed with epilepsy, aged between 4 and 11 years. The age distribution of the participants is summarized in Table 1. Participants' mean Quality of Life (QOL) score was 70.17 ± 12, while the mean Children's Sleep Health Questionnaire (CSHQ) score was 15.5 ± 5.7.

Table 1: Age Distribution of Children with Epilepsy

AGE	NUMBER
4-8 YEARS	39
8-11 YEARS	12

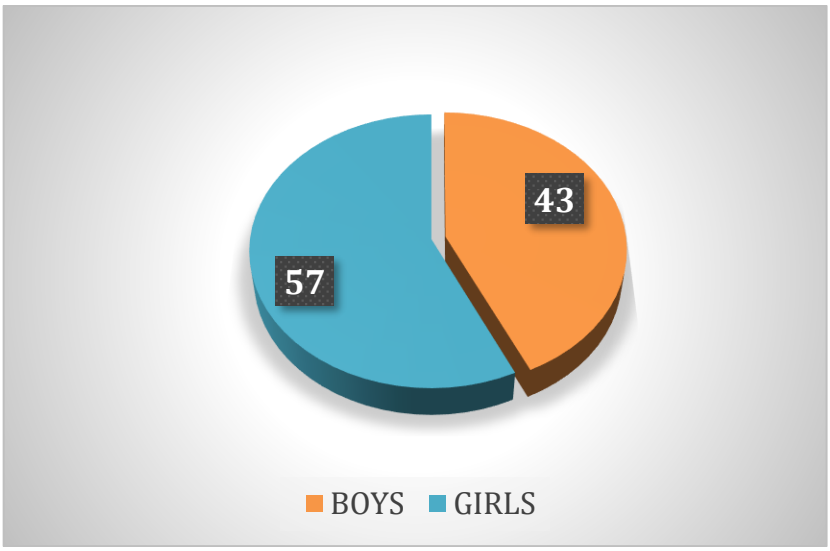


Figure 1: Gender Distribution of Study Participants

The pie chart represents the gender distribution of the subjects (boys vs. girls) of the study. According to the demographic data of the study, 57% of the participants were girls, and 43% were boys, as shown in Figure 1. The pie chart corresponds to the "Demographic Characteristics of Participants" part of the study, where 51 children with epilepsy were taken into account.

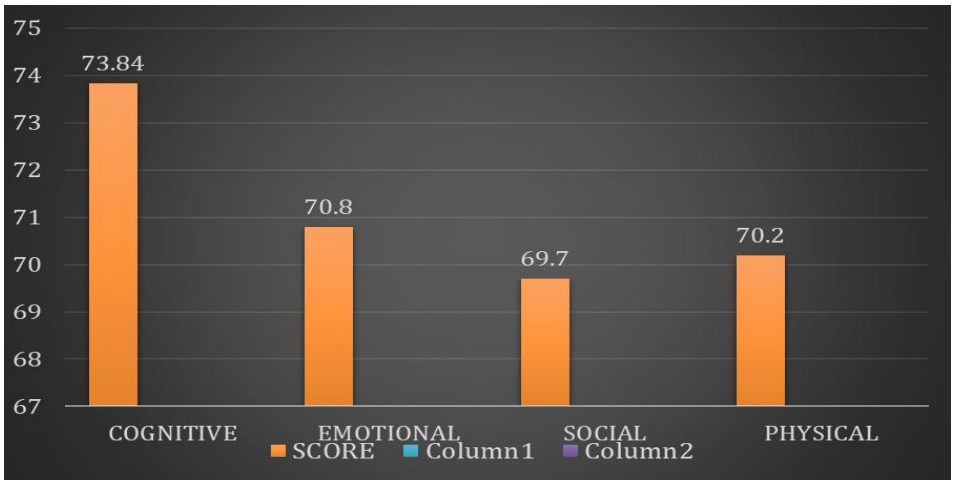


Figure 2: Comparison of Quality of Life (QOL) Scores Across Different Domains in Children with Epilepsy

The study results demonstrated a moderate quality of life level at 70.17 ± 12 for children with epilepsy. Children with epilepsy scored the highest in cognitive domain well-being (73.84) but experienced their lowest well-being in the social domain (69.7), as shown in Figure 2. The emotional domain scored 70.8, while the physical domain scored 70.2 among children with epilepsy.

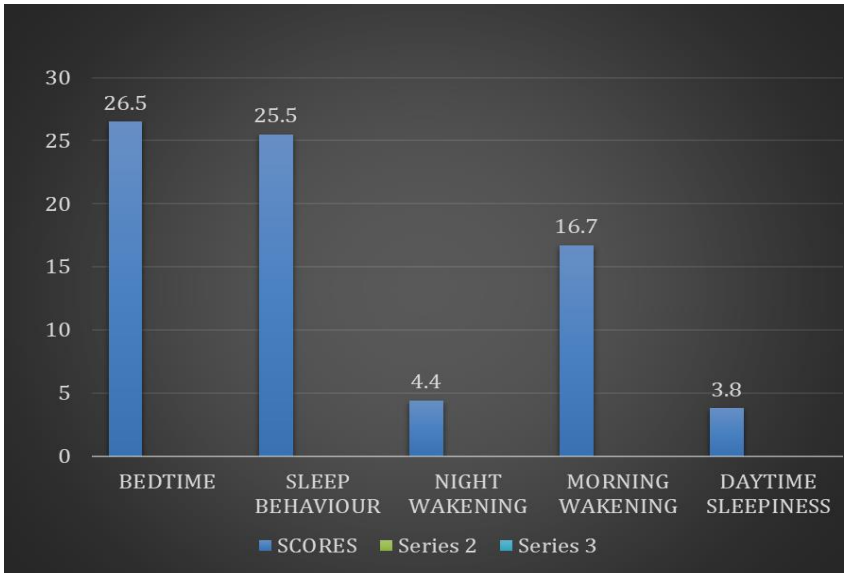


Figure 3: Distribution of Sleep Disturbances Among Children with Epilepsy

The highest disturbance scores belonged to bedtime (26.5) and sleep behavior (25.5), whereas night wakening (4.4) and daytime sleepiness (3.8) were the least reported. The impact of morning wakening on sleep patterns proved to be moderate according to the analysis results (16.7), as shown in Figure 3. Children with epilepsy demonstrated substantial sleep disturbance variations based on their CHSQ scores, which averaged 15.5 ± 5.7.

Correlation between QOL and Sleep Habits in Children with Epilepsy

The study showed QOL scores negatively linked with CHSQ scores at a very significant level ($r = -0.858$, $p < 0.01$), which confirmed poor sleep quality leads to reduced quality of life, as shown in Table 2. Children who faced more sleep disturbances showed a parallel decrease in their overall well-being according to this negative correlation pattern.

Table 2: Pearson Correlation Between QOL Score and CHSQ Score

	QOL Score	CHSQ Score
QOL Score	1	-0.858 (p < 0.01)
CHSQ Score	-0.858 (p < 0.01)	1

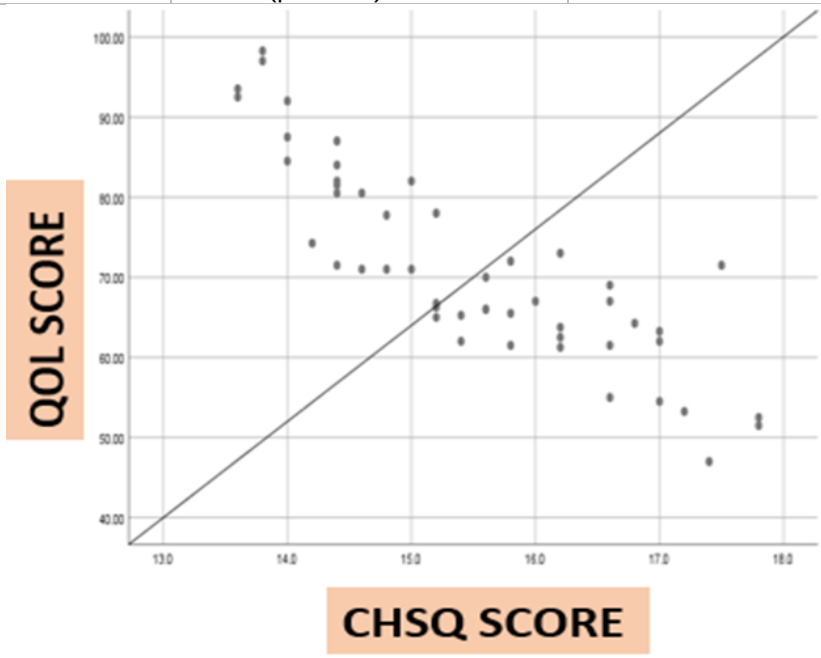


Figure 4: Correlation Between Children's Sleep Health Questionnaire (CSHQ) Scores and Quality of Life (QOL) Scores in Epileptic Children

It indicates that children with epilepsy who faced severe sleep disturbances had lower quality of life as shown in Figure 4. The data points in the pattern showed a direct downward relationship indicating a negative connection between sleep quality and overall well-being.

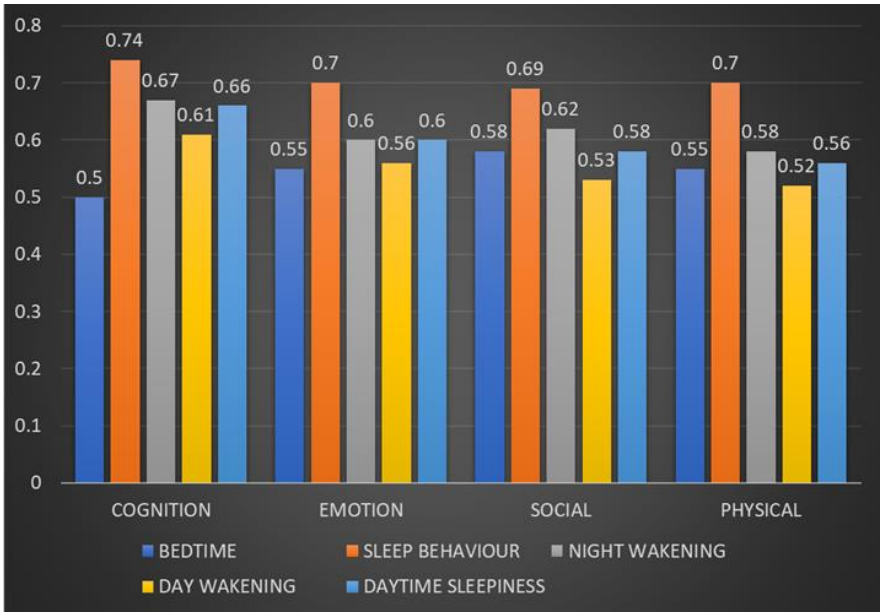


Figure 5: Correlation between sleep parameters with the four domains of quality of life

Sleep behaviors had the biggest negative effect on quality-of-life domains for children with epilepsy, resulting in 0.74 cognitive scores and 0.7 emotional, social, and physical scores, as Figure 5 demonstrates. Research findings showed bedtime and night wakening created moderate effects on all domains, yet daytime sleepiness and day wakening showed minimal impacts.

Statistical Analysis of QOL and CHSQ Scores Using ANOVA

ANOVA results showed a strong predictive effect through a significant relationship ($p < 0.001$) between the QOL score and CHSQ score, along with a high F-value (136.924), as shown in Table 3. The regression model demonstrated that sleep disturbances function as a primary factor that influences the quality of life in children with epilepsy by accounting for 50.913 units of variance.

Table 3: ANOVA Analysis for QOL Score and CHSQ Score

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	50.913	1	50.913	136.924	.000[b]
Residual	18.220	49	.372	-	-
Total	69.133	50	-	--	-

Dependent Variable: CHSQ SCORE
Predictors: (Constant), QOL SCORE

Regression Coefficients Analysis for QOL Score and CHSQ Score

The results from regression analysis showed that the QOL score acted as a substantial predictor of the CHSQ score with $\beta = -0.858$ ($p < 0.001$), as shown in Table 4. Each one-unit decrease in QOL score led to a significant increase in CHSQ score according to the unstandardized coefficient value ($B = -0.083$). The association between the QOL score and the CHSQ score proved robust because of the high t-value (-11.701).

Table 4: Regression Coefficients for QOL Score Predicting CHSQ Score

Model	Unstandardized Coefficients (B)	Std. Error	Standardized Coefficients (Beta)	t-value	Sig.	95% Confidence Interval for B (Lower Bound)	95% Confidence Interval for B (Upper Bound)
(Constant)	21.389	.511	-	41.819	.000	20.361	22.417
QOL SCORE	-.083	.007	-.858	-11.701	.000	-.097	-.069

The dependent variable in this table is CHSQ SCORE.

Discussion

The mean QOL score was 70.17 ± 12, and the mean CHSQ score was 15.5 ± 5.7, indicating that sleep disturbances have a significant impact on QOL in children with epilepsy. The least affected cognitive domain was the social domain (69.7), and the most impaired was the social domain (73.84). It also affected emotional (70.8) and physical (70.2) domains. Sleep behavior (0.74), night wakening, and daytime sleepiness (0.74) had the strongest negative influence on QOL. A strong negative correlation ($r = -0.858$, $p < 0.001$) was confirmed between worse sleep disturbances and poorer QOL. The link between epilepsy and sleep disorder is reinforced by Jain & Kothare (2015), who found that poor sleep increases seizure frequency and increases behavioral problems. According to Joseph et al. (2023), emotional distress from sleep disturbances was greater than cognitive impairments. Future research should look into the use of CBT-I as well as pharmacological treatments (Khalil et al., 2022). More clues are found with larger sample sizes and objective sleep monitoring (Kwon & Kim, 2019). The behavioral and clinical interventions may improve sleep quality and seizure management despite the limitations.

Conclusion

This study demonstrates that sleep quality plays a vital role in deciding the quality of life in children who have epilepsy. Sleep disturbances are strongly linked to better well-being and, therefore, need to be addressed in this population. Sleep hygiene practices and various planned interventions for the treatment of insomnia (Cognitive Behavioral Therapy for Insomnia) are implemented to ameliorate sleep and overall health. Sleep of high quality not only helps one to feel better and function better during the day, but also to better manage seizures. A comprehensive approach offers the best solution for managing sleep problems, which leads to enhanced long-term health results and quality of life for children with epilepsy. These children need combined medical and behavioral treatments to achieve better outcomes.

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