PREVALENCE OF SLEEP DISORDERS AND ASSOCIATED FACTORS IN CHILDREN WITH CEREBRAL PALSY IN BLACK LION HOSPITAL NEUROLOGIC AND DEVELOPMENTAL CLINIC, ADDISABABA, ETHIOPIA; A CROSS-SECTIONAL STUDY

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A RESEARCH THESIS TO BE SUBMITTED TO ADDIS ABABA UNIVERSITY, COLLEGE OF HEALTH SCIENCES; PEDIATRICS AND CHILD HEALTH DEPARTMENT IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE SPECIALTY CERTIFICATE PROGRAM IN PEDIATRICS AND CHILD HEALTH.

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ABBREVIATIONS AND ACRONYMS

AOR	Adjusted Odd Ratio
CBCL	Child Behavioral Check List
CI	Confidence Interval
CP	Cerebral Palsy
COR	Crude Odd Ratio
DA	Disorder of Arousal
DIMS	Disorder of initiating and maintaining of sleep
DOES	Disorder of Excessive Somnolence
ETB	Ethiopian Birr
GMFCS	Gross Motor Function Classification System
MOH	Ministry Of Health
NGO	Nongovernmental Organization
OR	Odd Ratio
SBD	Sleep Breathing Disorder
SD	Sleep Disorder
SDSC	Sleep Disturbance Scale for Children
SHY	Sleep hyperhidrosis
SPSS	Statistical Package for the Social Sciences
TS	Total Score
SWTD	Sleep-Wake Transition Disorder
UN	United Nation
WHO	World Health Organization

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ABSTRACT

Introduction: Sleep is critical for optimal growth and developmental outcomes in children. Those with cerebral palsy (CP) experience sleep disorders (SDs) at higher rates than neurotypical peers, with disruptions in sleep initiation/maintenance, sleep-wake transitions, excessive daytime sleepiness, and night awakenings being prevalent. These disturbances significantly impair quality of life. This study assessed the prevalence of SDs and associated factors among children with CP at Black Lion Hospital's Neurologic and Developmental Clinic in Addis Ababa, Ethiopia.

Objective:To evaluate the prevalence of SDs and identify contributing factors in children with CP attending Black Lion Hospital's Neurology and Developmental Clinic.

Methods: An institutional cross-sectional study was conducted from October 2024 to February 2025, involving 119 children selected via systematic sampling. Data were collected using the validated Sleep Disturbance Scale for Children (SDSC), administered by trained personnel, and analyzed in SPSS v25. Descriptive statistics (mean/median for continuous variables; percentages for categorical variables) and logistic regression (bivariate and multivariate models) were used to determine associations, with adjusted odds ratios (AORs) and 95% confidence intervals (CIs) reported.

Results: Among 119 participants, SD prevalence was 37% (95% CI: 26.0–47.9%). Disorders of initiating/maintaining sleep were most common (52.9%, n=63). Significant predictors included:

- **Spastic CP subtype** (AOR=10.60; 95% CI: 1.34–83.47; *p*=0.025)

- **Male sex** (AOR=13.23; 95% CI: 1.84–95.08; *p*=0.010)

- **Urban residence** (AOR=3.15; 95% CI: 0.68–14.53; *p*=0.014)

-**Severe motor impairment**(GMFCS Level V: AOR=5.70; 95% CI: 0.97–33.53; *p*=0.034; Level IV: AOR=3.55; 95% CI: 1.03–12.16; *p*=0.044)

-**Bed-sharing** (AOR=8.39; 95% CI: 1.21–58.13; *p*=0.031)

Conclusion and Recommendation

SD prevalence among children with CP at Tikur Anbessa Specialized Hospital (TASH) is substantial, with spastic CP, male sex, urban residence, severe motor dysfunction, and bed-sharing identified as key factors. Routine objective sleep assessments for CP patients are recommended to guide targeted interventions.

Keywords: Sleep disorders, Sleep Disturbance Scale for Children (SDSC), Cerebral Palsy, Tikur AnbesaSpecializedHospital(TASH),Ethiopia

1. INTRODUCTION

1.1 Background:

Cerebral palsy (CP) encompasses a spectrum of lifelong motor impairments caused by disruptions in early brain development, leading to movement and postural limitations (1). As the most prevalent physical disability in childhood, it affects approximately 1.5–3 per 1,000 live births globally (3). Beyond motor challenges, children with CP frequently experience co morbidities such as epilepsy, cognitive impairments, and sleep disturbances, which collectively diminish their quality of life (3).

CP is a chronic neurodevelopmental condition that manifests in early childhood and persists into adulthood, ranking among the foremost causes of physical disability worldwide (3). Sleep disturbances in this population are particularly concerning, as adequate sleep is essential for neurological maturation, physical growth, and psychological resilience. Chronic sleep disruptions exacerbate familial stress and disrupt household dynamics, compounding the challenges faced by caregivers (4).

A 2015 study by Newman et al. involving 173 school-aged children with CP in Dublin found that 22.3% exhibited clinically significant sleep abnormalities, highlighting the prevalence of this issue (5). Sleep, a cyclical physiological state marked by decreased responsiveness to environmental stimuli, is vital for cognitive function, emotional regulation, and physical restoration. Sleep quality encompasses factors like latency, continuity, and restorative efficacy, with poor sleep linked to adverse health outcomes across populations (6).

In children with CP, sleep disorders often manifest as fragmented sleep, nocturnal awakenings, breathing irregularities, and circadian rhythm disruptions. These underdiagnosed issues worsen functional limitations and are frequently overlooked in clinical settings (7). Common symptoms include prolonged sleep onset, daytime fatigue, snoring, and parasomnias such as sleepwalking (8). Up to 80% of children with CP experience sleep disturbances, which correlate with symptom severity and may signal clinical deterioration if unaddressed (9). Compared to neurotypical peers, this population demonstrates higher rates of sleep latency, reduced sleep efficiency, and diminished overall sleep quality (10), contributing to poorer mental health and increased vulnerability to chronic conditions (11).

The International Classification of Sleep Disorders categorizes these disruptions into eight domains: insomnia, parasomnias, sleep-related breathing disorders, hypersomnia, movement disorders, circadian rhythm disruptions, and atypical sleep behaviors (12). Adequate sleep duration (≥7 hours for most age groups) is critical for physiological homeostasis, with insufficient sleep linked to increased morbidity and mortality (13). The National Sleep Foundation provides evidence-based guidelines for age-specific sleep requirements to optimize health outcomes (14).

The Sleep Disturbances Scale for Children (SDSC), a validated 26-item tool, evaluates six sleep domains: initiation/maintenance difficulties (DIMS), breathing irregularities (SBD), arousal disorders (DA), sleep-wake transition issues (SWTD), excessive daytime sleepiness (DOES), and nocturnal sweating. Scores exceeding 70 (≥2SD above norms) indicate clinically significant disturbances (5).

In Ethiopia, limited published research exists on sleep disorders among children with CP, particularly at Tikur Anbessa Specialized Hospital (TASH). This study addresses this gap by investigating the prevalence and determinants of sleep disturbances in children attending TASH's Neurological and Developmental Clinic.

1.2 Statement of Problem

Sleep disorders often originate from neurological dysfunctions that interfere with natural sleep cycles, hindering individuals from achieving restorative rest. The recommended daily sleep duration for most adults ranges from 7 to 10 hours. As the central regulator of sleep, the brain not only demands adequate rest but also thrives when well-rested. Chronic sleep deprivation can diminish overall well-being, and unresolved sleep-related conditions may escalate into severe health risks and comorbidities (17).

Globally, awareness of sleep health remains inadequate, especially in low- and middle-income regions. Recent research has aimed to bridge this knowledge gap, revealing that approximately 150 million individuals worldwide experience sleep disorders (18). In a multinational collaborative study, scientists from the University of Warwick Medical School in the UK investigated sleep challenges across eight countries in Asia and Africa. The research sought to

evaluate the prevalence of sleep disruptions in understudied populations where such issues are often overlooked (19).

The study's outcomes indicated that over 17% of participants in these regions reported sleep-related difficulties—a figure comparable to the estimated 20% prevalence observed in high-income nations (4).

Cerebral palsy (CP), a leading cause of chronic physical disability, typically manifests in early childhood and endures across an individual's lifespan (20). Children with CP face elevated risks of sleep disturbances due to neurological injuries linked to the condition. Contributing factors include intellectual disabilities, visual impairments, seizure disorders, and side effects of anti-epileptic drugs. Additional influences encompass obstructive sleep apnea, restricted mobility from muscle contractures or spasticity, chronic pain from musculoskeletal issues or orthotic devices, and dental complications (21).

Newman et al. conducted a study involving 173 school-aged children with CP at Dublin's Central Remedial Clinic, revealing that 39 participants (22.3%) exhibited clinically significant sleep abnormalities (5). Similarly, Karatas et al. analyzed mortality records of 177 CP patients and identified that 19 individuals (10.7%) had died unexpectedly during sleep at home (22).

Despite these findings, limited data exists on sleep disorders among children with CP in low-resource settings. This study aims to address this gap by investigating the prevalence of sleep disturbances and associated risk factors in children diagnosed with cerebral palsy at the Black Lion Hospital Neurologic and Developmental Clinic in Addis Ababa, Ethiopia.

1.3. JUSTIFICATION OF THE STUDY

Children with cerebral palsy (CP) face an elevated susceptibility to disrupted sleep patterns, largely attributed to neurological impairments linked to their condition. Contributing factors include coexisting intellectual disabilities, visual deficits, seizure disorders, and adverse effects of anti-epileptic therapies. Additional risks arise from physical limitations, such as restricted mobility due to muscle contractures or spasticity, obstructive sleep apnea, and chronic discomfort caused by musculoskeletal complications, dental problems, or prolonged use of

orthotic devices.

These sleep challenges extend beyond the children themselves, imposing significant burdens on caregivers. Despite the scale of this issue, comprehensive studies remain scarce in Ethiopia. This research seeks to evaluate the prevalence and determinants of sleep disorders among children with CP, providing critical insights to guide clinical interventions and therapeutic strategies. By establishing baseline data on prevalence and associated factors, the findings will inform tailored treatment plans and preventive measures.

The study addresses a notable gap in regional and national research, as no prior investigations on this topic have been documented in Ethiopia. Its outcomes will serve as foundational evidence for future studies while offering actionable insights for mental health professionals, policymakers, the Ministry of Health (MOH), and NGOs to allocate resources effectively and design targeted support programs for affected families.

1.4. SIGNIFICANCE OF THE STUDY

This study aims to assess the prevalence of sleep disorders and associated factors in children with cerebral palsy at Black Lion Hospital Neurologic and Developmental Clinic in Addis Ababa, Ethiopia.

Sleep is one of the restorative processes which affected highly in children with cerebral palsy. When the sleep pattern is disturbed in these children with cerebral palsy, in addition to different disturbing symptoms from the nature of the illness, the outcome become worse and the affected individual will be subjected to more disturbances to the extent of harming him/herself or others. This is a continuous problem existing ever and widely speared in these children with cerebral palsy and needs investigation to give way for solution. Although knowing the magnitude of sleep disorder and managing well is vital, no study is found which was done to know the sleep disorder and what associated with it among these subjects in our country to our best knowledge. . So, this study is aimed to assess the prevalence of sleep disorders and associated factors in children with cerebral palsy in Black Lion hospital Neurologic and developmental clinic, Addis Ababa, Ethiopia and will try to fill the knowledge gap concerning the problem.

Knowing the distribution of the problem will help the health care provider and educator to give evidence based services, policy makers to act accordingly and help children with cerebral palsy in preventing further disturbance and complications. This leads to quality improvement and shortens the duration of the treatment which is so long among these patients and in turns improves the outcome or progress of the treatment. The findings of this study also will be used as a baseline data for future researchers, health planners and program managers to improve the problem and give quality services. In addition, the findings of the study will help the clinicians to appreciate the prevalence of the problem and make sound decision on managements of the issue.

2. LITERATURE REVIEW

2.1. Prevalence of Sleep Disorders

Research indicates that sleep disorders are significantly more common among children with cerebral palsy (CP) than in their neurotypical peers, with prevalence rates reaching up to 46% in CP populations compared to 20–30% in typically developing children (25). These disturbances include insomnia, sleep-disordered breathing, parasomnias, and circadian rhythm disruptions, though reported rates vary across studies due to differences in diagnostic criteria and methodologies (26).

A 2018 study by McLaren et al. highlighted that over 40% of children with CP experience severe sleep disruptions, such as irregular sleep cycles, prolonged sleep latency, and frequent nighttime awakenings (27). Similarly, Andersen et al. (2017) found that 20% of children with CP exhibited sleep-disordered breathing (e.g., obstructive sleep apnea [OSA]), while 35% struggled with initiating and maintaining sleep. OSA risk in this population is linked to hypotonia, abnormal muscle tone, and comorbid respiratory conditions (28). Pain-related sleep challenges are also prevalent, as musculoskeletal discomfort, spasticity, and joint contractures in CP often hinder comfortable sleep positioning (Shevell et al., 2018) (29).

A study by Newman et al. involving 173 school-aged children with CP in Ireland revealed that 23% had clinically significant sleep scores, with common issues including sleep-wake transition difficulties, OSA, and insomnia. This contrasts sharply with a 5% prevalence observed in the general pediatric population (30). In Malaysia, a case-control study of 109 children with CP (89% spastic, 9% dyskinetic, 2% mixed) found significantly higher sleep disturbance scores compared to siblings, particularly in sleep initiation, breathing disorders, and hyperhidrosis. Caregiver sleep duration under seven hours and prolonged sleep latency (>30 minutes) were strongly associated with these disturbances, while co-sleeping showed no significant impact (16).

Italian research assessing 165 children with CP using standardized tools (SDSC, GMFCS, CBCL) identified abnormal sleep scores in 19% of participants, with over 40% exhibiting issues in at least one sleep domain (31). A Ugandan cross-sectional study of 135 children reported a 32% prevalence of sleep disorders, primarily sleep initiation/maintenance difficulties (27%), linked to bilateral spasticity, severe motor/functional impairments, and epilepsy (32).

In low-resource settings like Ethiopia, sleep disorders in CP remain underrecognized due to limited healthcare access and awareness. A South African study found 30–40% of children with CP experience sleep problems, particularly those with severe motor deficits and comorbidities like epilepsy, suggesting similar challenges in Ethiopia (32).

2.2. Factors Associated With Sleep Disorders

2.2.1. Socio-Demographic Influences

A Chinese cross-sectional study at Ningxia Mental Health Center linked sleep disturbances in children with CP to lower parental education, poverty, crowded living conditions, and marital instability (33). Conversely, Italian research noted reduced insomnia risk in older children (31), while Ugandan data highlighted gender disparities: females had longer sleep duration, higher efficiency, and shorter latency compared to males (32).

In India, a 14% insomnia prevalence was tied to hypertension, anxiety, and depression, which impaired daily functioning (34). A Ghanaian national survey of 9,484 participants found longer sleep duration (>7 hours) associated with youth, female gender, rural residence, higher education, employment, and higher income (35).

2.2.2. Clinical Factors

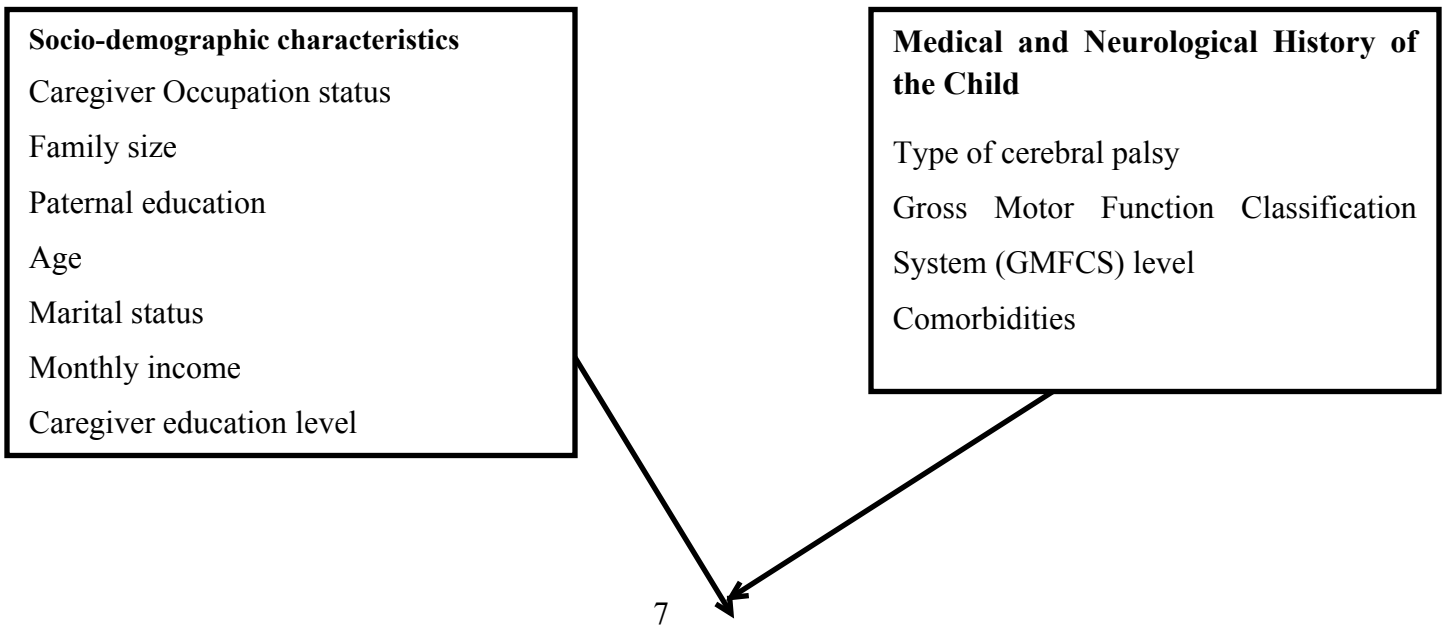
Motor impairment severity strongly correlates with sleep disruptions. Italian studies revealed that 48% of children classified as GMFCS Level V (most severe motor limitations) had sleep issues, with GMFCS scores predictive of sleep problems (31, 36).

Psychiatric comorbidities also play a role. An Iranian study of 100 stable schizophrenia patients found poorer sleep quality and functional impairment in those with positive symptoms (e.g., hallucinations) compared to negative symptoms (e.g., apathy), though sleep latency and medication use did not differ (37). Conversely, Portuguese research evaluating 23 children with schizophrenia using the SDSC found both symptom groups scored above clinical thresholds for sleep disorders, with no significant intergroup differences (10).

These findings underscore the multifaceted etiology of sleep disturbances in CP, necessitating holistic assessment of socio-demographic, clinical, and environmental factors.

2.3. Conceptual frame work

Based on an existing literature review on prevalence of sleep disorders and associated factors in children with cerebral palsy in Black Lion hospital Neurologic and developmental clinic framework was created. The framework was used to create research tools and design processes. Three categories of independent variables (distal, intermediate and proximal) and the dependent variable is prevalence of sleep disorders of the study participants. The association is represented by one directional relation of the independent variable on the dependent variable with relations between the independent variables. It is organized by investigator after reviewing for different literatures. In this conceptual framework a simple linear association is considered (Figure I).



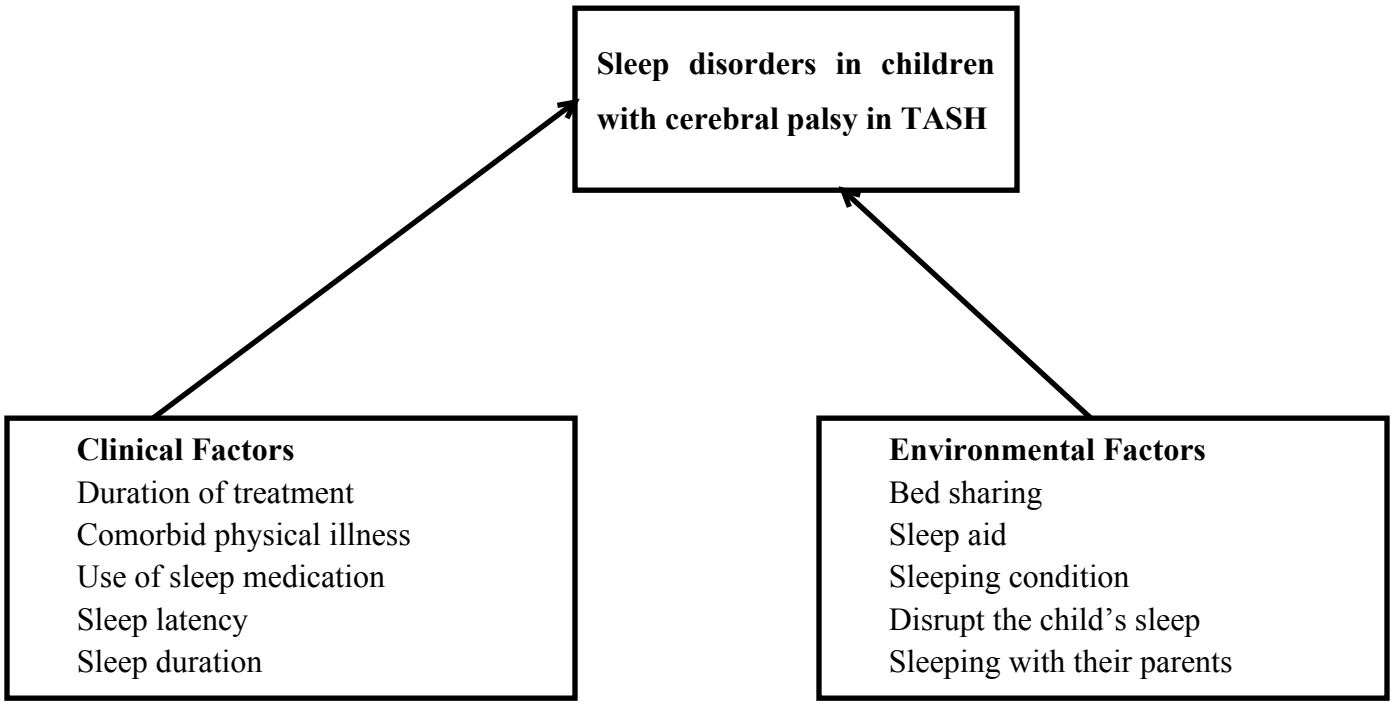


Figure 1: Conceptual framework to assess prevalence of sleep disorders and associated factors in children with cerebral palsy, in TASH Neurologic and developmental clinic, Addis Ababa, Ethiopia(31, 32)

3. OBJECTIVES

3.1. General objective

- ✓ To assess prevalence of sleep disorders and associated factors in children with cerebral palsy in Black Lion hospital Neurologic and developmental clinic, Addis Ababa, Ethiopia, 2024.

3.2. Specific objectives.

- ✓ To assess prevalence of sleep disorders in children with cerebral palsy in Black Lion hospital Neurologic and developmental clinic, Addis Ababa, Ethiopia, 2024.
- ✓ To assess the associated factors of sleep disorders in children with cerebral palsy in Black Lion hospital Neurologic and developmental clinic, Addis Ababa, Ethiopia, 2024.

4. METHODS

4.1. Study area

Addis Ababa is the political capital and the most important commercial and cultural hub of Ethiopia. It is geographically located at the heart of the nation at 9º 1'N latitude and 38º44’E longitude and has an elevation of 2355 meter above sea level, with the highest elevation at Entoto Hill to the north, reaching 3,200 meters.The city is divided into 116 woredas, the smallest administrative entities, and 11 sub-cities.

TikurAnbessa Specialized Hospital (TASH) is the teaching hospital of College of Health Sciences (CHS), Addis Ababa University (AAU). TASH is the largest specialized hospital in

Ethiopia, with over 700 beds. It offers diagnosis and treatment for approximately 370,000-400,000 patients per year. It serves as a training center for undergraduate and postgraduate medical students, dentists, nurses, midwives, pharmacists, medical laboratory technologists, radiology technologists, and others who shoulder the health problems of the community and the country at large.

4.2. Study design and period

Hospital based cross sectional study was conducted from October 2024 to February 2025

4.3. Description of population

4.3.1. Source population

The source population of the study was all children aged 6-15 years who are on follow up at TASH, neurology and developmental clinic, Addis Ababa, Ethiopia, 2024.

4.3.2. Study population

The study populations were all children aged 6-15 years with cerebral palsy and on follow up at Black Lion Hospital, neurology and developmental clinic, Addis Ababa, Ethiopia, 2024.

4.4. Study units

All children aged 6-15 years in this study were the study units.

4.4. Eligible population

4.4.1. Inclusion criteria

- ✓ Children aged 6 -15 years with a diagnosis of cerebral palsy based on clinical and or neuroimaging finding
- ✓ Children attending the neurological and developmental clinic at TASH for at least 6 months, ensuring that they have an established treatment history
- ✓ Care givers who can provide informed consent and agree to participate in the study

4.4.2. Exclusion criteria

- ✓ Children whose caregivers are unable to provide accurate information regarding their sleep patterns

- ✓ Families who do not consent to participate in the study
- ✓ Children with concurrent medical conditions that independently affect sleep (epilepsy

4.5. Sample size determination

To determine the sample size for this study, outcome variable and various factors significantly associated with the outcome variable are considered.

4.5.1. Sample size of objective one for prevalence of sleep disorder among children with cerebral palsy

Sample size was calculated by using single population proportion formula. Therefore, sample size was determined by the formula as follows:-

Using (d) = 0.05 and the appropriate precision assumption

In which n is the predicted sample size, Z is the confidence level (alpha), P is the prevalence, and d is margin of error. The researchers used the following assumption while calculating sample size: according to a previous related study conducted in Uganda, 32% of children with cerebral palsy of sleep disorders(32), 95% confidence level and 5% margin of error, then the sample size for this particular study were determined with the consideration of the following assumptions as follow.

Assumptions: A 95% confidence level, margin of error (0.05)

Sample size =Sample size (n) $=\left\{z^2pq\middle|d^2\right\}$

Where:

p = best estimate of population proportion= 0. 32

q = 1- p

q = 1 – 0.32= 0.68

n = the required sample size

d^2 = margin of error =5 % (0.05)

$$n=\frac{1.96^2\times0.68\times0.32}{(0.05)^2}=334$$

Actual sample size after using 10% for non-response rate =368

4.5.2. Sample size of objective two: factors associated with sleep disorder among children with cerebral palsy

These sample size was determined by EPI info software version 7.2.1.0 using significant associated factors from different articles. Significant variable was selected, power of the software (80%), confidence interval ratio (95%) and odds ratio outcome non-exposed (1:1) and exposed was adjusted to calculate sample size of each selected variables. **(Table 1)**

S.N	Variable	Power	CI	Ratio	Exposed	Non exposed	Sample size	Reference
1	Residence	80%	95%	1:1	67%	22%	46	(31)
2	Sex	80%	95%	1:1	44.5% o	19.3%	118	

Table 1: Sample size determination of associated factors using EPI data version: 7.2.1.0 to assess prevalence of sleep disorders and associated factors in children with cerebral palsy in cerebral palsy in TASH Neurologic and developmental clinic, Addis Ababa, Ethiopia.

The calculated sample size (368 children) was used by systematic random sampling technique, but the total number of children (119) is less than the calculated sample size. Therefore, the PI would select all Children aged 6 -15 years with a diagnosis of cerebral palsy based on clinical and or neuroimaging finding (and those fulfilling the inclusion criteria) in the hospital. So, 119children were selected for this study from the hospital.

4.6. Sampling Technique

Selection of the clients was used by systematic random sampling technique. The total estimated number of children in the hospital was calculated to give the total sample size using the following formula.

$$I= \frac{N}{n}$$

Where I= systematic sampling technique sampling interval

N= Estimated number of children with cerebral palsy in Black Lion hospital Neurologic and developmental clinicper day= 20 & number of days for the data collection= 15

N= 10 × 30= 300

n= Number of respondents (sample size) = 119

$$I= \frac{300}{119}=2.5\sim3$$

A sampling interval of three was used to select the sample size of 119. The first child was selected randomly. The second child was selected every three children and there after continued until the required sample size was met.

4.7. Data Collection Tools and Procedures

From October 02 2024 to February 19, 2025, data was collected through face-to-face interviews using a structured, pre-tested Amharic version questionnaire for children with Cerebral palsy. To maintain uniformity, the questionnaire was written in English, translated into Amharic, and then returned to English. With some modifications to reflect the local context, the questionnaire was adapted from earlier studies. The caregivers who presented at the Cerebral Palsy rehabilitation clinic or the Pediatric Neurology clinic were informed about the study, its importance and its objectives and screened for eligibility. Caregivers of eligible children were asked for consent to participate in the study. Sleep disorder was assessed by using the Sleep Disturbances Scale for Children (SDSC).

The Sleep Disturbance Scale for Children (SDSC) is a 26-item rated on a Likert scale and the sum of scores yields a total sleep score (Total SDSC) and six sleep disturbance subscales: (1) difficulty in initiating and maintaining sleep/ insomnia (DIMS);sleep breathing disorders (SBD); (1) disorders of arousal/nightmares (DA); (4) sleep–wake transition disorders (SWTD); (5) disorders of excessive somnolence (DOES); and (6) sleep hyperhidrosis. Higher T scores are correlated with increased sleep disturbance. Standardized norms are available and a T score of more than 70 (>2SD above the normative mean) is regarded as pathological(16)

The questionnaire is divided into three sections, including 1) Socio-demographic characteristics of mothers, 2) clinical factors and Medical and Neurological History of the Child and 3) Sleep Disturbances Scale for Children (SDSC) (Annex 2). The interview was facilitated by a total of 4 diploma nurses, 3 data collectors and 1 BSc nurses supervisor.

4.8. Variables

Dependent variable

Sleep disorders in children with cerebral palsy

Independent variables

Socio-demographic characteristics

- ✓ Child's age
- ✓ Child's gender
- ✓ Child's place of residence
- ✓ Primary caregiver's level of education
- ✓ Primary caregiver's average household monthly income
- ✓ Family members live in your household

Medical and Neurological History of the Child

- ✓ Cerebral palsy
- ✓ Child diagnosed with cerebral palsy
- ✓ Gross Motor Function Classification System (GMFCS) level of the child
- ✓ Presence of Epilepsy

Clinical factors

- ✓ Duration of treatment
- ✓ Comorbid physical illness
- ✓ Use of sleep medication
- ✓ Sleep latency
- ✓ Sleep duration

Environmental Factors

- ✓ Bed sharing
- ✓ Sleep aid
- ✓ Sleeping condition
- ✓ Disrupt the child's sleep
- ✓ Sleeping with their parents

4.9. Operational definitions

Sleep Disturbances Scale for Children (SDSC): This is a validated, self-administered / interview questionnaire used to measure sleep disorder. It is a 26-item questionnaire with each item rated from 0 to 5 (difficulty in initiating and maintaining sleep/ insomnia (DIMS); sleep breathing disorders (SBD); disorders of arousal/nightmares (DA); sleep–wake transition disorders (SWTD); disorders of excessive somnolence (DOES); and sleep hyperhidrosis)(39).

Pathological sleep:A T-score of more than 70 (>95 percentile) was regarded as pathological

Normative sleep:T-score of 70 or less was taken as the normal range.

Sleep latency:A period from “lights out” or from bed time to the sleep onset(21).

Comorbidity:a chronic disease that coexisted with their diabetes were considered to be comorbid(8).

The Gross Motor Function Classification System(GMFCS): isresponded to the need for a standardized, clinically applicable system that was valid and reliable. This five-level system is based on the underlying construct of self-initiated functional abilities in sitting, walking, and the need for assistive devices such as walkers or wheelchairs. It classifies children with CP by their age-specific gross motor activity and aims to determine which level best represents the child's or youth's present abilities and limitations(32).

4.10. Data Analysis

Data was cleaned and entered into a computer using EpiInfo version 7.02 Data was exported in to SPSS version 26 statistical software for analysis.Total score and scores of individual sleep disorders were categorized into pathological and normal based on the normative data for the scale(39). A T-score of more than 70 (>95 percentile) was regarded as pathological and T-score of 70 or less was taken as the normal range. Bivariate analysis was carried out to identify variables that are significantly associated with sleep disorder children with cerebral palsy. Collinearity was diagnosed using VIF and tolerance and also HoshmerLemeshow and Omnibus test was performed to test for model fitness. Those Variables in bivariate analysis whose p value less than 0.25 ($p<0.25$) will be included in multiple logistic regression not to miss associated factors. Then multiple logistic regression analysis was performed for those factors that showed a statistically significant association in bivariate analysis and investigate independent predictors by controlling for possible confounders.

Finally, to eliminate confounding effects, multivariate logistic regression was performed to see the influence of one independent variable on the dependent variable while controlling the effect of the other independent variable.

4.11. Data quality control

Data collectors and supervisors were also trained for one day to ensure the quality and validity of data, Regular supervision, and spot checking and reviewing the completed questionnaire was carried out by supervisor and by the principal investigators on daily basis. The supervisor and the primary investigator verified the completed questionnaires for consistency and completeness on the spot.

Data collectors and the supervisor received a one-day training session. To verify its validity the questionnaire was reviewed by professionals with previous experience conducting Sleep Disturbances Scale for Children (SDSC).A pre-test of the questionnaire was conducted on 5% of the sample size (6children) done in St. Paul's Hospital which was part of the selected hospital in order to cross-check for objective and variable-based completeness, consistency, and acceptability of the questionnaire. Before being given to data collectors, the questionnaire was rigorously reviewed for completeness. The participants were informed about the study's goal and were assured that their responses would be kept anonymous, allowing them to give honest answers. To verify the completeness and consistency of the acquired data, the primary investigator and supervisor conducted regular follow-up and periodic checks on the data collection process. Some respondents' ages was underestimated, so the median age of respondents within the same research year will be used instead.

Before the collection of all the necessary data, question was pre-coded and template repaired for data entry by the principal investigator. Data entry and cleaning was done using EPIINFO version 7 statistical packages and was exported to SPSS software version 26. Data cleaning was performed by running frequencies of each variable to check for accuracy and inconsistencies.

4.12. Ethical Consideration

Ethical approval was obtained from ethical review committee of Addis Ababa University, College of Health Sciences; Pediatrics and Child Health Department. The name of the study subject was not listed on the questionnaire and confidentiality was kept.

4.13. Dissemination of the Results

The findings of this study will be submitted to Addis Ababa University, College of Health Sciences; Pediatrics and Child Health Department, Addis Ababa public Health Research and Emergency Management Directorate, Addis Ababa Regional health Bureau.

RESULT

5.1. Socio-demographic characteristics

This cross-sectional study collected data from 119 participants to assess sleep disorders and associated factors among children with cerebral palsy (CP) at Tikur Anbessa Specialized Hospital (TASH) in Addis Ababa. All distributed questionnaires were completed, validated, and included in the analysis, yielding a 100% response rate.

Participant Demographics

The cohort comprised children aged 4–16 years (mean age: 9.66 ± 5.535 years). Over half (56, 47.1%) were older than 12 years, followed by 42 (35.3%) aged 8–12 years, and 21 (17.6%) under 8 years. Males constituted the majority (58%).

Caregiver Socio-Demographics

Caregiver education levels included:

- Secondary education: 50 (42%)

- Tertiary education: 35 (29.4%)

- No formal education: 22 (18.5%)

- Primary education: 12 (10.1%)

Most participants (66, 55.5%) resided in urban areas. Household sizes of ≤4 members were reported by 51.3% (61), while 31.1% (37) of families had monthly incomes exceeding 10,000 ETB. The average household income was 5,727.04 ETB (±4,020.48 SD).

Table 2 summarizes socio-demographic characteristics of the study population.

Characteristics	**Category**	**Frequency**	**Percent**	**Mean and SD**
Age	<8 years	21	17.6	9.66(SD±5.535)
	8-12 years	42	35.3	
	>12 years	56	47.1	
Sex	Male	69	58	
	Female	50	42	
Residence	Urban	66	55.5	
	Rural	53	44.5	
Educational Status of the caregivers	No formal education	22	18.5	
	Primary education	12	10.1	
	Secondary education	50	42	
	Higher education	35	29.4	
Monthly income	<2000	28	23.5	5727.04(SD± 4020.48)
	2000-5000	26	21.8	
	5000-10000	28	23.5	
	>10000	37	31.1	
Family size	<4	61	51.3	4.03(SD± 1.74)
	4-6	35	29.4	
	>6	23	19.3	

5.2. Clinical characteristics of the study participants

The majority of participants (83.2%, *n*=99) were diagnosed with the spastic CP subtype, followed by mixed CP (13.4%, *n*=16) and dyskinetic CP (3.4%, *n*=4). The mean age at CP diagnosis was 3.52 years (±0.565 SD). Gross Motor Function Classification System (GMFCS) levels varied: Level V (28.6%, *n*=34), Level II (26.1%, *n*=31), Level I (23.5%, *n*=28), Level IV (12.6%, *n*=15), and Level III (9.2%, *n*=11).

Sleep patterns revealed that 34.5% (*n*=41) of children slept 5–6 hours nightly. Sleep latency averaged 25 minutes (±15.0 SD), with 33.6% (*n*=40) reporting delays of 15–30 minutes. Concurrent medication use was reported in 33.6% (*n*=40) of cases.

Table 3 summarizes clinical characteristics of the study cohort.

Characteristics	Category	Frequency	Percent	Mean and SD
Types of CP	Spastic CP	99	83.2	3.12(SD±0.815)
	Dyskinetic CP	4	3.4	
	Mixed	16	13.4	
Age of child diagnosed with CP	3-4 years	94	79	
	>5 years	25	21	
Gross Motor Function Classification (GMFC)	level I	28	23.5	
	level II	31	26.1	
	level III	11	9.2	
	level IV	15	12.6	
	level V	34	28.6	
Medication	Yes	40	33.6	
	No	79	66.4	
Sleep latency	Less than 15 minutes	29	24.4	
	15-30 minutes	40	33.6	
	30-60 minutes	33	27.7	
	More than 60 minutes	17	14.3	
Sleep duration	Less than 5 hours	20	16.8	
	5-6 hours	41	34.5	
	6-8 hours	36	30.3	
	More than 8 hours	22	18.5	

5.3. Environmental characteristics of the study participants

Thirty-five children (29.4%) were sharing their bed with their mothers. Sixteen out of 35 caregivers (45.7%) having disturbed sleep, were sharing beds with the children**(Table 4)**

Table 4: Environmental characteristics of children with cerebral palsy in TASH, neurological and developmental clinic, Addis Ababa, Ethiopia, 2024 (n= 119).

Characteristics	Category	Frequency	Percent
Bed sharing	Yes	35	29.4
	No	84	70.6
Disrupt the child's sleep(N=35)	Yes	16	45.7

	No	19	54.3
Child use any sleep aids	Yes	63	52.9
	No	56	47.1
Type of sleep aid does the child use(N=63)	Pillows	60	95.2
	Special mattresses	3	4.8
Sleeping conditions	Yes	63	52.9
	No	56	47.1

5.4. Sleep disorder in children according to SDSC

Total score and scores of individual sleep disorders were categorized into pathological and normal based on the normative data for the scale(39). A T-score of more than 70 (>95 percentile) was regarded as pathological and T-score of 70 or less was taken as the normal range. Thirty children (25.2%) had disorder of arousal. The most common type of sleep disturbances was Disorder in initiating and maintaining sleep (DIMS)(52.9%).**(Table 5)**

Table 5: Sleep disturbance in children with cerebral palsy in TASH, neurological and developmental clinic, Addis Ababa, Ethiopia, 2024. (n= 119).

	DMIS	SBD	DOA	SWTD	DOES	SH	TS
Score range	7-29	3-15	3-11	6-18	5-19	2-9	25-79
Mean ± SD	13.25 (± 5.23)	6.07 (± 3.17)	4.03 (± 1.96)	9.80 (± 4.05)	7.93 (± 4.18)	3.44 (± 1.84)	43.48 (± 14.67)
Normal sleep	516(47.1)	88(73.9)	89(74.8)	68(57.1)	75(63)	75(63)	75(63)
Pathological sleep	63(52.9)	31(26.1)	30(25.2)	51(42.9)	44(37)	44(37)	44(37)

5.5. Prevalence of sleep disorders

The overall prevalence of sleep disorders among children with cerebral palsy in TASH, neurological and developmental clinic, Addis Ababa was 37% [95%CI: 26.0%-47.9%] and the mean (SD) SDSC score was 43.48(±14.67).**(Figure 2**)

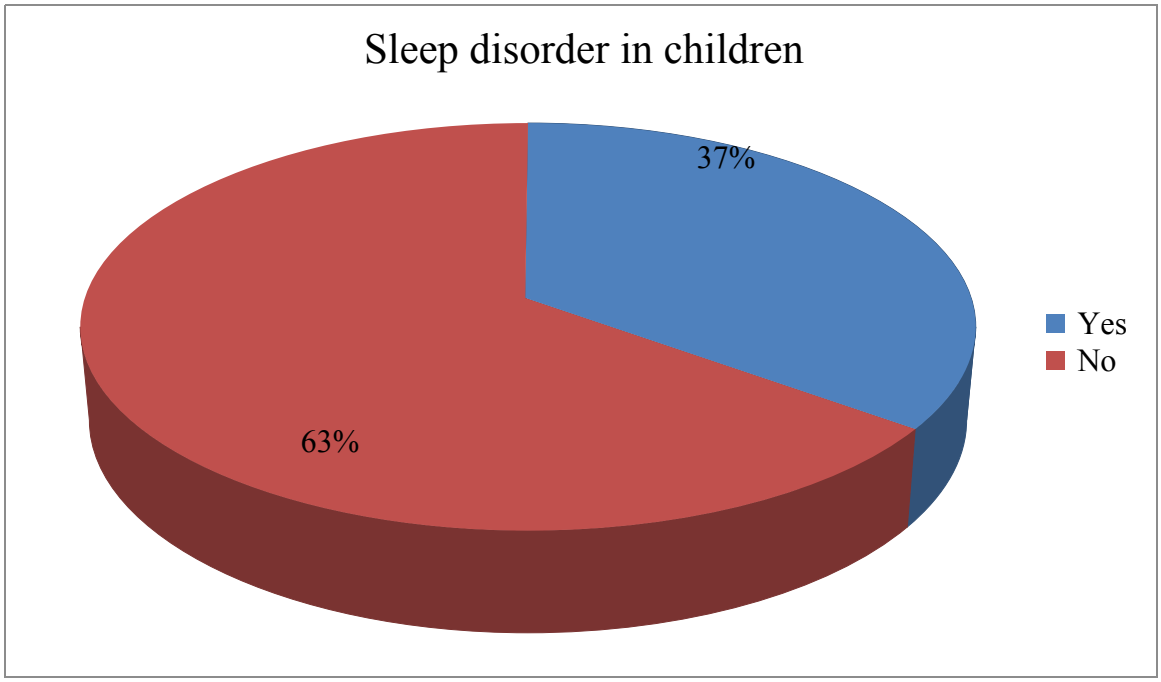


Figure 2:Shows overall prevalence of sleep disorders among children with cerebral palsy in TASH, neurological and developmental clinic, Addis Ababa, 2024 (n=119)

5.6. Associated Factors with sleep disorders among children with cerebral palsy

Bivariate logistic regression identified marginally significant associations (*p* < 0.25) between sleep disorders and variables including age, sex, caregiver education, income, residence, family size, CP subtype, bed-sharing, GMFCS level, and age at CP diagnosis.

Following adjustment for confounders in multivariate analysis, sex, residence, CP subtype, GMFCS level, and bed-sharing remained statistically significant predictors (*p* < 0.05):

- **Spastic CP subtype**: Adjusted odds ratio (AOR) = 10.60 (95% CI: 1.34–83.47; *p* = 0.025).
- **Male sex**: AOR = 13.23 (95% CI: 1.84–95.08; *p* = 0.010).
- **Urban residence**: AOR = 3.15 (95% CI: 0.68–14.53; *p* = 0.014).
- **Severe motor impairment**:
  - GMFCS Level V: AOR = 5.70 (95% CI: 0.97–33.53; *p* = 0.034).
  - GMFCS Level IV: AOR = 3.55 (95% CI: 1.03–12.16; *p* = 0.044).
- **Bed-sharing**: AOR = 8.39 (95% CI: 1.21–58.13; *p* = 0.031).

Table 6summarizes bivariate and multivariate logistic regression outcomes.

Characteristics	Sleep disorders		**COR(95%CI)**	**AOR(95%CI)**
	Yes	**No**		
Age in years				

<8years ®	31	30	1	1
8-12years	10	25	1.51(0.71-3.95)	3.79(0.24-59.62)
>12years	3	20	1.61(0.68-3.81)	25.35(1.26-50.4)
Sex				
Male	17	52	3.59(1.64-7.83)*	13.23(1.84-95.08)*
Female®	27	23	1	1
Family size				
<4®	10	11	1	1
4-6	12	30	2.58(1.06-6.28)*	8.39(1.21-58.13)
>6	22	34	6.88(1.85-25.61)*	2.59(0.15-44.03)
Residence				
Urban	19	47	2.20(1.03-4.71)*	3.15(0.68-14.53)*
Rural®	25	28	1	1
Educational status				
No formal education®	14.	8	1	1
Primary education	4	8	1.26(0.54-3.60)	1.79(0.07-8.54)
Secondary education	9	41	1.88(0.47-7.44)	2.56(1.02-11.54)
Higher education	17	18	4.30(1.61-11.46)	15.45(1.74-8.04)
Monthly Income				
<2000®	9	19	1	1
2000-5000	8	18	3.46(1.23-9.76)	13.59(2.04-48.50)
5000-10,000	4	24	3.69(1.27-10.72)	2.96(0.39-22.07)
>10,000	23	14	9.85(2.82-34.39)	2.56(1.61-17.28)
Types of Cerebral Palsy				
Spastic CP	41	58	2.10(0.81-5.43)	10.60(1.34-98.47)*
Dyskinetic CP	2	2	2.04(0.66-6.41)	2.02(0.01-11.13)
Mixed CP	1	15	1	1
Bed sharing all night more than 6 months				
Yes	23	12	5.75(2.44-13.52)	11.36(2.01-64.03)*
No®	21	63	1	1
Gross Motor Function Classification (GMFC)				
level I®	11	17	1	1
level II	6	25	1.95(0.70-5.41)	1.22(0.22-10.37)
level III	6	5	5.27(1.72-16.16)	1.54(0.49-4.85)
level IV	2	13	1.05(0.26-4.13)	3.55(1.03-12.16)*
level V	19	15	8.23(1.37-13.31)	5.70(0.97-33.53)*
Children age diagnosed with CP				
3-4 years	10	11	1	1

>5 years	15	22	1.33(0.45-3.92)	1.02(0.06-16.83)

P<0.05, **p<0.001*- Statistical significant, ®- Reference categories

DISCUSSION

This hospital-based cross-sectional analysis evaluated the prevalence and correlates of sleep disorders (SDs) among children with cerebral palsy (CP) at Tikur Anbessa Specialized Hospital (TASH) in Addis Ababa. The study identified SDs in 37% of participants (95% CI: 26.0–47.9%), a rate exceeding findings from Italy (13%) and Ireland (22.5%) (5, 31). This disparity may stem from TASH's role as Ethiopia's national referral center, which disproportionately serves severe CP cases. Conversely, the prevalence aligns with studies in Uganda (32%) and Malaysia (30%) (32, 40) but remains lower than reports from the USA (50.8%), Brazil (51.3%), and South Korea (53.3%) (5, 26, 41), likely reflecting differences in sample demographics and methodologies.

The cohort comprised predominantly males (58%) and adolescents over 12 years (47.1%), consistent with global CP gender distributions, though some regions report slight female

predominance (42). Disorders of Initiating and Maintaining Sleep (DIMS) were most prevalent (52.9%), followed by Sleep-Wake Transition Disorder (SWTD, 42.9%), hyperhidrosis (37%), and Sleep Breathing Disorders (SBD, 26.1%). These patterns mirror observations in Uganda, Malaysia, and prior research (5, 31, 32, 40).

Key predictors of SDs included:

-**Spastic CP subtype** (AOR=10.60; 95% CI: 1.34–83.47; *p*=0.025), aligning with studies linking spasticity to pain and immobility-related sleep disruptions (5, 31, 32, 43).

- **Male sex** (AOR=13.23; 95% CI: 1.84–95.08; *p*=0.010) and **urban residence** (AOR=3.15; 95% CI: 0.68–14.53; *p*=0.014), corroborating findings from Turkey and China (1, 44), possibly due to behavioral or environmental sleep interference.

- **Severe motor impairment** (GMFCS Level V: AOR=5.70; 95% CI: 0.97–33.53; *p*=0.034; Level IV: AOR=3.55; 95% CI: 1.03–12.16; *p*=0.044), consistent with global evidence tying limited mobility and caregiver dependency to poor sleep (5, 31, 32).

- **Bed-sharing** (AOR=8.39; 95% CI: 1.21–58.13; *p*=0.031), potentially reflecting heightened nighttime care needs or restricted bed mobility (5, 31, 32).

Implications

The high SD burden in this cohort underscores the need for targeted sleep interventions, particularly for children with spastic CP, severe motor deficits, or urban residency. Implementing routine sleep assessments in CP care protocols at TASH could enhance early detection and management

STRENGTH AND LIMITATION

7.1. STRENGTH

- ✓ The questioner was pretested on similar setting and a necessary modification was made to minimize the difficulty during the data collection.
- ✓ Full information was given about the objective of the study and agreement was obtained from clients, before data collection, and daily checkup made for the completeness of the questionnaire at field level and during data collection time
- ✓ Using the standard tools and sufficient response rate could be seen as strength of this study.
- ✓ The study provided useful information that will inform policy makers to design a strategy to reduce the prevalence of sleep disorders.

7.2. LIMITATION

While interpreting the findings of this study, scholars need to take into consideration the following limitations.

- ✓ As it was a cross-sectional nature of study design could not allow drawing any definite conclusions concerning causal relationship between sleep disorder and associated factors. Additionally, absence of comparable data in the same subjects in our country should consider because of socio-economic difference of current study setting and the previous studies.
- ✓ It also limited to conduct certain in-depth interviews or focus group discussions among the primary caregiver's for further qualitative exploration of the case to back the quantitative data. However, time and logistic constraining factors prevented the researcher from doing so.
- ✓ Despite these limitations, the study was able to give some insight and clue about the problem and factors associated with it which in turn could help professionals to open their eyes and give attention to the problem.

CONCLUSIONS AND RECOMMENDATIONS

8.1. CONCLUSIONS

More than one third of children with cerebral palsy have disorders of sleep in TASH in Addis Ababa, Ethiopia in general which was considered higher. The most common type of sleep disorders in children with cerebral palsy was disorders in the initiation and maintenance of sleep (DIMS).Result of this study revealed that, spastic cerebral palsy, urban residence, levels of gross motor function V and IV, being male and bed-sharing were associated with Sleep disorders among children with cerebral palsy at p-value < 0.05.

8.2. RECOMMENDATIONS

Based on the finding of the study the following recommendations are forwarded

- Healthcare providers should incorporate routine sleep screenings into the follow-up care of children with CP to ensure early detection and intervention.
- Caregivers should receive guidance on sleep hygiene practices, behavioral interventions, and relaxation techniques to help manage sleep problems at home.
- Establishing caregiver support groups can provide families with shared experiences, coping strategies, and access to resources.
- Longitudinal studies can help researchers learn more about the path of sleep disorder, which could lead to better health care and wellbeing.

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ANNEX 1:-INFORMATION SHEET AND CONSENT FORM

ADDIS ABABA UNIVERSITY, COLLEGE OF HEALTH SCIENCES

PEDIATRICS AND CHILD HEALTH DEPARTMENT

Participant Information Sheet

Title of the study: PREVALENCE OF SLEEP DISORDERS AND ASSOCIATED FACTORS IN CHILDREN WITH CEREBRAL PALSY IN BLACK LION HOSPITAL NEUROLOGY AND DEVELOPMENTAL CLINIC, ADDIS ABABA, ETHIOPIA, 2024

Name of Principal Investigator: Kalkidan Mekuanint (MD: Final year Pediatrics and Child Health Resident at TASH)

Advisor: Atsede Teklehaimanot (MD; Pediatric and Child Health Specialist)

Introduction

My Name is _____I came from _____I am a student of specialty certificate program in pediatrics and child health in Addis Ababa University, College of Health Sciences. I would like to inform you that you and I would have a short discussion concerning this study. Before we go to our discussion, I will request you to listen carefully to what I am going to read to you about the purpose and general condition of the study and tell me whether you agree or disagree to participate in this study.

Purpose of the study

The purpose of this study is to assess the prevalence of sleep disorders and associated factors in children with cerebral palsy in Black Lion hospital Neurologic and developmental clinic, Addis Ababa, Ethiopia2024. This research undertaking is a specialty certificate program in pediatrics and child health in partial fulfillment research thesis.

Procedures and participation

You are selected to be one of the participants in the study. The study will be conducted through interviews. We are asking you for a little of your time, about 30 to 45 min, to help us in this

study. Your cooperation and willingness for the interview is very helpful in identifying the problem related to the issue.

Confidentiality and privacy

Interviewing will take place in a private. We would like to assure you that this privacy was strictly be maintained throughout. A code was used to identify your participation and no name will be used for your responses to any of the questions that were not being given to anyone else. No report of the study was ever identifying you. If a report of results is published, only information about the total group will appear. The original data was locked in cabinets until the data analysis carryout and no person shall access except the PI and the advisor for data checking and cleaning purpose. It was then being destroyed in a secured manner after the research defense and final work is approved by the school of pediatrics and child health department and academic commission and university senate.

Freedom to withdraw

The interview is voluntary. If you want to participant in the study, you have full right to with draw from the study any time you wish our participation/ non participation, or refuse to respond to the questions will have no effect now or in the future.

Benefits, risks, and incentives

The study does not incur any risks because of your involvement. Please be informed that there is no any direct benefit in a form of incentives or money attached to your participation in this study. Your response is essential to generate information for designing effective level knowledge of sleep disorder

Contact persons

For any other additional information about the study, please contact the principal investigator and her advisor by the following address:

Name, address and Tel number of PI: Name: Kalkidan Mekuanint (MD: Final year Pediatrics and Child Health Resident at TASH), Tel: +251 91 357 2545

Primary advisor: Atsede Teklehaimanot (MD; Pediatric and Child Health Specialist)Tel: +251 91 007 0579

I would like to thank you for your time and for the information you are willing to share with me. If you have any questions about your rights as a study participant or questions or concerns about any aspect of the study, you may freely ask.

PEDIATRICS AND CHILD HEALTH DEPARTMENT

Informed Consent Form

Title: PREVALENCE OF SLEEP DISORDERS AND ASSOCIATED FACTORS IN CHILDREN WITH CEREBRAL PALSY IN BLACK LION HOSPITAL NEUROLOGY AND DEVELOPMENTAL CLINIC, ADDIS ABABA, ETHIOPIA, 2024

I have been well aware of that this research undertaking is a post graduate degree partial fulfillment of research thesis which is fully supported and coordinated by Select College and the designate principal investigator is Kalkidan Mekuanint (MD: Final year Pediatrics and Child Health Resident at TASH). I have been fully informed in the language I understand about the research project an objective that is to assess the prevalence of sleep disorders and associated factors in children with cerebral palsy in Black Lion hospital Neurologic and developmental clinic, Addis Ababa, Ethiopia,2024.I have been informed that all the information I shall provide to the interviewer was kept confidential. I understood that the research has no any risk and no composition. I also knew that I have the right to withhold information, skip questions to answer or to withdraw from the study any time I have acquainted nobody was impose me to explain the reason of withdrawal. It is also enlighten there would have no effect at all in my health benefit or other administrative effect that I get from the refuge.

I have assured that the right to ask information that is not clear about the research before and or during the research work and to contact:
Kalkidan Mekuanint (MD: Final year Pediatrics and Child Health Resident at TASH)

Tel: +251 91 357 2545

I have read this form, or it has been read to me in the language I comprehend and understood the condition stated above, therefore, I am willing and confirm my participation.
Are you willing to participate in this study? 1, Yes 2, NO
Name of data collector: _____
Signature _____Date _____

ANNEX 2: QUESTIONNAIRE (ENGLISH VERSION)

PART I- SOCIO-DEMOGRAPHIC CHARACTERSTICS

S.no	Questions	Possible response	Remark
Q101	Child's age	_____age in years	
Q102	Child's gender	1. Male 2. Female	
Q103	Child's place of residence	1. Urban 2. Rural	
Q104	Primary caregiver's level of education	1. No formal education 2. Primary education 3. Secondary education 4. Higher education	
Q105	Average household monthly income	_____ in ETB	
Q106	Family members live in your household	_____ in numbers	

PART II- CLINICAL CHARACTERISTICS OF THE STUDY PARTICIPANTS

No	Questions	Possible responses	Remark
Q201	How many hours does the child typically sleep per night?	Less than 5 hours 5-6 hours 6-8 hours More than 8 hours	
Q202	How long does it take for the child to fall asleep on average?	1. Less than 15 minutes 2. 15-30 minutes 3. 30-60 minutes 4. More than 60 minutes	

Q203	Does the child take any medication to help with sleep?	1. Yes 2. No	
Q204	If yes, what sleep medication is the child taking?		

PART III- MEDICAL AND NEUROLOGICAL HISTORY OF THE CHILD

Q301	What type of cerebral palsy does the child have?	1. Spastic 2. Dyskinetic 3. Ataxic 4. Mixed	
Q302	At what age was the child diagnosed with cerebral palsy?		
Q303	What is the Gross Motor Function Classification System (GMFCS) level of the child?	1. Level I 2. Level II 3. Level III 4. Level IV 5. Level V	
Q304	Presence of epilepsy	1. Yes 2. No	

PART IV- SLEEP DISTURBANCE SCALE FOR CHILDREN

This questionnaire will allow your doctor to have a better understanding of the sleep-wake rhythm of your child and of any problems in his/her sleep behavior. Try to answer every question; in answering, consider each question as pertaining to the past 6 months of the child's life. Please answer the questions by selecting the appropriate button.

Q401	How many hours of sleep does your child get on most nights?	1. 9-11 hours 2. 8-9 hours 3. -8 hours 4. 5-7 hours 5. less than 5 hours	

Q402	How long after going to bed does your child usually fall asleep?	1. Less than 15 minutes 2. 15-30 minutes 3. 30-45 minutes 4. 45-60 minutes 5. more than 60 minutes				
		Never	**Occasionally**	**Sometimes**	**Often**	**Always**
Q403	The child goes to bed reluctantly.					
Q404	The child has difficulty getting to sleep at night.					
Q405	The child feels anxious or afraid when falling asleep.					
Q406	The child startles or jerks parts of the body while falling asleep.					
Q407	The child shows repetitive actions such as rocking or head banging while falling asleep.					
Q408	The child experiences vivid dream-like scenes while falling asleep					
Q409	The child sweats excessively while falling asleep.					
Q410	The child wakes up more than twice per night.					
Q411	After waking up in the night, the child has difficulty falling asleep again.					
Q412	The child has frequent twitching or jerking of legs while asleep or often changes position during the night or kicks the covers off the bed.					
Q413	The child has difficulty breathing during the night.					

Q414	The child gasps for breath or is unable to breathe during sleep.					
Q415	The child snores.					
Q416	The child sweats excessively during the night.					
Q417	You have observed the child sleepwalking.					
Q418	You have observed the child talking in his/her sleep.					
Q419	The child grinds teeth during sleep					
Q420	The child wakes from sleep screaming or confused so that you cannot seem to get through to him/her, but has no memory of these events the next morning.					
Q421	The child has nightmares which he/she doesn't remember the next day.					
Q422	The child is unusually difficult to wake up in the morning.					
Q423	The child awakes in the morning feeling tired.					
Q424	The child feels unable to move when waking up in the morning.					
Q425	The child experiences daytime somnolence.					
Q426	The child falls asleep suddenly in inappropriate situations.					
Disorders of initiating and maintaining sleep (sum the score of the items 1,2,3,4,5,10,11)						
Sleep breathing disorders (sum the score of the items 13,14,15)						

Disorders of arousal (sum the score of the items 17,20,21)	
Sleep-wake transitions disorders (sum the score of the items 6,7,8,12,18,19):	
Sleep-wake transitions disorders (sum the score of the items 6,7,8,12,18,19):	
Sleep-wake transitions disorders (sum the score of the items 6,7,8,12,18,19):	
Total score (sum 6 factors scores):	

Scoring

Parents use a five-point Likert-type scale to indicate how frequently their children exhibit certain behaviors: 1 means "never," while five corresponds with "always (daily)." Respondents also offer estimates of sleep quantity and onset time. Higher scores indicate more acute sleep disturbances. To obtain results, scores are tallied for each of the six sleep-disorder categories, and an overall score is calculated.

PART V- SLEEP ENVIRONMENT

S.no	Questions	Possible response	Skip
Q501	Bed sharing	1. Yes 2. No	
Q502	Disrupt the child's sleep	1. Yes 2. No	
Q503	Child use any sleep aids	1. Yes 2. No	
Q504	If yes, what type of sleep aid does the child use?		
Q505	Does the child have access to proper sleeping conditions	1. Yes 2. No	

Have completed the questions thank you very much!!!