

Assessing the Anxiety and Sleep Quality among Caregivers of Children with Cerebral Palsy at Ubad Gargaar Special Needs Center, Somaliland: A Mixed-Methods Design

Peiter Gideon

peitergideon@gmail.com

Edna Adan University

Hana Khadar Aden

Ubad Gargaar Special Needs Children Center

Amina Mohamed Ali

Ubad Gargaar Special Needs Children Center

Jennifer Jean Rocheleau

Ubad Gargaar Special Needs Children Center

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Abstract

Background

Cerebral palsy (CP) is the most common cause of physical disability in childhood, with disproportionately high burden in low- and middle-income countries (LMICs). Although child outcomes are well-documented, less is known about caregiver mental health in high-stigma, low-resource settings like Somaliland.

Objective

To assess anxiety and sleep quality among primary caregivers of children with CP at Ubad Gargaar Special Needs Center, Somaliland.

Methods

The design employed was an explanatory sequential mixed-methods approach. Quantitative phase: between May and July 2026, a facility-based cross-sectional survey of 49 primary caregivers (whole population sampling from 62 registered) of children with cerebral palsy aged 4 to 18 was conducted. Pearson correlation and multivariable linear regression were used to measure anxiety using the GAD-7 and sleep quality using the culturally modified PROMIS Sleep Disturbance Short Form 4a plus one caregiver-specific item. Qualitative phase: 30 caregivers were purposively sampled and split into 10 Case groups (high anxiety, poor sleep), 10 Control groups (low anxiety, good sleep), and 10 Moderate groups (moderate anxiety, good sleep) for in-depth interviews (45–60 minutes, in Somali). Braun & Clarke's six-step method was employed for thematic analysis in NVivo 14. Joint display was used for integration.

Results

Caregivers were predominantly biological mothers (91.8%), aged 25–39 years (67.4%), unemployed (85.7%), and 34.7% had no co-caregiver. Children with severe characteristics included those with at least one comorbidity (75.6%), moderate-to-severe malnutrition (75.5%), spastic CP (83.6%), and GMFCS Level V (61.3%). Only 6.2% of people had normal anxiety, 36.8% mild anxiety, 42.7% moderate anxiety, and 14.3% severe anxiety (93.8% any anxiety). Ironically, 63.3% of respondents frequently got up at night to take care of their children, while 79.5% reporting decent sleep quality. There was a strong positive correlation between anxiety and sleep disturbance ($r = 0.435$, $p = 0.002$). With trend-level signals for co-caregiver presence and comorbidities, regression models for anxiety ($R^2 = 0.134$, $F = 0.673$, $p = 0.728$) and sleep ($R^2 = 0.164$, $F = 0.849$, $p = 0.577$) were not statistically significant. Five themes surfaced: 1) physically demanding caring; 2) disrupting children's sleep and providing care at night; 3) role overload and self-care sacrifice; 4) caregiver worry, rumination, and sleep impairment; and 5) protective factors

and coping mechanisms. Conditional anxiety, co-regulation, adaptive sleep hygiene (early bedtime), and acceptance coping helped the moderate group stay asleep despite their anxiety.

Conclusion

In Somaliland, a vulnerable caregiver population with almost ubiquitous concern is created by severe cerebral palsy. Relational and cultural resources, however, mitigate the relationship between worry and sleep. As an expansion of Obbarius et al.'s modified Transactional Model, we suggest the Ubad Gargaar Model of Caregiver Resilience, in which Personal Resources (co-caregiver, acceptance, Ubad Gargaar) more potently reduce Stress Response than Environmental Stressors.

BACKGROUND

Neurodevelopmental disorders (NDDs) encompass a broad range of mental disorders which are characterized by an onset in early childhood and include intellectual developmental disorders, communication disorders, autism spectrum disorder (ASD), attention-deficit/hyperactivity disorder (ADHD), specific learning disorders, and motor disorders [1]. Cerebral palsy (CP) with permanent neuromuscular spasticity, cognitive dysfunction, behavioral impairments, speech and visual issues, as well as challenges in feeding and gastrointestinal functions. CP is classified into spastic, ataxic, dyskinetic, hypotonic, and mixed forms, with quadriplegic CP being the most severe type. Hospital-based data from Addis Ababa, Ethiopia indicate that 60.4% of children with CP have spastic quadriplegia, often accompanied by speech difficulties (95.4%), cognitive impairments (87.4%), epilepsy (60.9%), and sensory impairments [2–4].

Globally, prevalence of CP is not exactly known due to a lack of standardized data registries and research across all continents, it is estimated to be around 2.0 to 2.5 per 1000 live births. However, the Ugandan and Bangladesh studies showed higher prevalence of CP of 2.9 and 3.4 per 1000 children respectively. Literature shows that 10 out of every 1000 children born in Southern Africa have the condition [5–8]. Therefore, the prevalence of CP in sub-Saharan Africa is estimated to be in the range of 2.4 to 3.6 per 1000 children. Moreover, up to 70% of children with CP, which are classified as having moderate-to-severe impairment, admitted in clinical settings [9]. According to the 2021's Health Management Information System (HMIS) in Malawi, there were 6,149 children below the age of 15 years with cerebral palsy attending physiotherapy services. In Mangochi, there were 462 children aged 0–15 years with cerebral palsy. As a result, the burden of CP is high in LMICs, as like Somaliland and are mostly due to preventable causes [10, 11].

As one of the most common causes of physical disability in childhood, CP has significant long-term consequences not only for the child but also for their family [12]. Risk factor are the inability to communicate emotional states and needs in general, sleep disturbances, comorbid psychiatric symptoms, and environmental influences (e.g., sensory stimuli, cognitive and/or social overload or restrictions of repetitive or stereotyped behavior) [13]. Sleep problems among children with

developmental disabilities are more common than in typically developing children. Shorter total sleep time has been associated with increased parental depressive symptoms [14]. In addition, many children with cerebral palsy have complex limitations in self-care functions rendering them completely reliant on their parents, especially those who require special and long-term support. Parents reported poorer sleep quality and severe sleep disturbances (insomnia symptoms and sleep efficiency). Consequently, poor sleep among parents may increase psychological problems, well-being, and decrease energy levels. Furthermore, anxiety is a significant predictor of sleep quality [9, 15–18].

Parenting with developmental disability children can experience happiness, fulfillment, strength, and family closeness. However, parents are greater risk for diminished emotional health, such as depressive symptoms and impaired quality of life, especially in Sub-Saharan Africa [19, 20]. They tend to struggle with confusion, increased stress and anxiety, loneliness, labeling, and face marital problems. Parental burnout (PB), defined as chronic physical and mental fatigue, is a chronic stress-related syndrome experienced in the parental role, resulting in negative health, normal routines, and quality of life (QoL) consequences [15, 21–24]. Socially, parents frequently encounter stigma, reduced social interactions, and isolation, which can limit their access to emotional support, from extended family or community members [12]. In resource-limited settings where infrastructural amenities, social support, and healthcare systems are not adequately developed, physical and psychological well-being can be impacting some caregivers [25]. Moreover, socioeconomic status, the child's behavior, family dynamics, and physical condition can influence mental and physical health of caregivers. However, the social support provided by family, friends, neighbors, and public services, has a mediating influence and can promote better self-perception and stress relief [26, 27].

There are few specialized services for children with impairments in Somaliland, which presents serious healthcare issues. Ubad Gargaar Special Needs Center offers children with cerebral palsy and other neurodevelopmental disorders therapy and support. The prevalence, clinical profile, and caregiver burden of NDDs in this context, however, are not well documented. Understanding the local context is essential for creating culturally appropriate interventions, since the prevalence of CP is high in LMICs and primarily caused by avoidable causes. Hence, the purpose of the study is to assess the primary caregiver's sleep quality and anxiety at the Ubad Gargaar Special Needs Center in Somaliland.

METHOD

Study Design and Area

The study used an explanatory sequential mixed-methods design. The quantitative phase was a facility-based cross-sectional survey, followed by a qualitative phase using in-depth interviews to explain statistical results. The research carried out at the Ubad Gargaar Special Needs Center in Hargeisa, Somaliland. One of the few facilities in Somaliland that providing regular physiotherapy and rehabilitative services to children with cerebral palsy and related neurodevelopmental problems.

Participants

Participants were caregivers with age 18 years or older. The total number of caregivers available for this period determined the sample size. The interviewed-participants were the primary caregiver at home, living together in the house providing care, permanently live in the area at least six months, and willing to participate in the study. All participants had a child (1) diagnosed with cerebral palsy and (2) aged 4–18 years of age that were receiving physiotherapy services at the center. However, caregivers who were absent during the data collection period and did not provide confirmation of their participation were excluded from the study.

Sample Size

Due to target population was limited and accessible, whole population sampling was employed to maximize statistical power and minimize sampling bias. Out of 62 registered caregivers with cerebral palsy's children aged over 4 years, only 49 participants were successfully recruited and there were no dropouts; 13 participants were excluded due to absence during data collection and lack of confirmation. For the qualitative analysis, a purposive sampling method was used. Thirty participants were selected for in-depth interviews, with 10 mothers with low level of anxiety and good sleep quality (group control), 10 mothers with high level of anxiety and poor sleep quality (group case), and 10 mothers with moderate to severe anxiety but good sleep quality (group moderate). Based on qualitative research guidelines, a sample size of 10 participants per group was chosen, suggesting that 10–15 interviews are sufficient to reach data saturation in homogeneous groups. Additionally, the recruitment and sampling flow diagram is provided in Supplementary Data 1.

Data Collection

Data were collected between May to July 2026. The study was consisted to three parts. The first part included demographic characteristics of caregivers, second part included assessment of standardized instruments (GAD-7 and PROMIS Sleep Disturbance T-Score), and third part included in-depth interviews. Every participant was required to fill out a demographic questionnaire that requested details about (a) the caregiver data: age, relationship to the child, marital status, occupation, and presence of co-caregivers and (b) the child data: age, gender, presence of comorbidities (epilepsy, visual/hearing impairment, feeding difficulties, or mixed), CP subtypes, and Gross Motor Function Classification System (GMFCS) level [28]. Quantitative study measured about prevalence of anxiety and sleep disturbances. Afterward, in-depth interviews with a subset of caregivers elaborated daily experience, sleep experience, emotional well-being, coping strategies, and social support. Semi-structured interviews, lasting 45 to 60 minutes, were carried out in a private room at the center by qualified interviewers in Somali. Audio recording was not conducted to ensure participant confidentiality and privacy. The principal investigator was present during all interviews conducted by Somali interviewers to provide supervision and ensure the completeness and accuracy of data collection. Nonverbal indicators were noted in the field. Rather,

thorough field notes and complete transcriptions of the interviews were performed, and members verified the accuracy.

Generalized Anxiety Disorder 7-item scale (GAD-7). The GAD-7 was a 7 item, 4-point Likert scale (0 = "Not at all" to 3 = "Nearly every day") was measuring anxiety severity over the past 2 weeks with total score 0–21. Meanwhile, 0–4 indicated minimal, 5–9 mild, 10–14 moderate, and 15–21 severe anxiety [29]. In this sample, the GAD-7 showed outstanding internal consistency (Cronbach's $\alpha = 0.701$, 7 items). The four-item PROMIS Sleep Disturbance Short Form 4a plus one caregiver-specific item on disturbances to child care at night was used to measure the quality of sleep. Items used a 4-point rating system to evaluate sleep quality, restoration, issues, and trouble falling asleep throughout the previous seven days. The extra item, "My sleep was interrupted because of my child's needs," encapsulated caregiver-specific disruptions that were typical of people with cerebral palsy. Higher scores indicated more sleep disturbance. The sum of the scores was varied from 5 to 20. Sleep Disturbance 4a (t-score from 32 to 73.4, 32–54 within normal limits, 55–60: mild, 61–70: moderate, and 71–73.3: severe) measured sleep disturbance. One additional Likert item was included to capture caregiver-specific burden and analyzed separately as an ordinal variable (1–3: rarely and 4–5: frequently) [30, 31]. In this sample, the PROMIS Sleep Disturbance showed outstanding internal consistency (Cronbach's $\alpha = 0.579$, 5 items). Additionally, GAD-7 and PROMIS Sleep Disturbance were translated and culturally adapted to Somali following WHO guidelines.

Following development, the guides were reviewed by a mix method research expert, one of physiotherapy, and two of nutritionist (including two health professional familiar with the local context). After incorporating expert feedback, the English version was translated into Somali to ensure both linguistic and conceptual equivalence, a second independent translator, blinded to the original English version and perform a back-translation into English. The original and back-translated versions were compared to identify inconsistencies and discrepancies. The final Somali guide was pilot-tested with two parents (not included in the main study) to evaluate clarity, logical flow, and contextual appropriateness. Minor revisions were made based on the pilot feedback.

Statistical Analyses

Data were entered into the Statistical Package for Social Sciences (SPSS) version 26 for statistical analysis. Descriptive statistics were performed as appropriate to characterize the sociodemographic, CP subtypes, GMFCS levels, anxiety and sleep quality status, and underlying factors. Pearson correlation coefficient was used to assess the linear relationship between anxiety scores (GAD-7) and sleep disturbance scores (PROMIS Sleep Disturbance), Multivariable analysis (linear regression) was utilized to assess the relationship among variables. *P*-values < 0.05 were considered statistically significant. Interviews were translated into English and transcribed verbatim. Thematic analysis was conducted in NVivo 14 using Braun & Clarke's six-step approach. 20% of transcripts were independently coded by two coders in order to determine inter-coder reliability (Cohen's $\kappa > 0.80$). Integration occurred through a joint display comparing GAD-7 scores with qualitative themes on coping strategies.

Ethical Considerations

Ethical approval to conduct this study was obtained from **Edna Adan Committee Ethics Committee** (IRB no.158/2026). The Declaration of Helsinki’s guidelines were followed in the conduct of the study. Written informed consent in Somali was obtained from all participants. Withdrawals were possible at any time without impacting services. Data have been stored on encrypted drives after being de-identified.

RESULT

Study participants and background characteristics

Table 1. Characteristic of respondents

Characteristics	Frequency (Percentage), n=49
Age of Mothers/Caregivers	
<25 years	6 (12.20)
25-39 years	33 (67.40)
40-54 years	10 (20.40)
Relationship to child	
Mother	45 (91.80)
Other (sister, aunty)	4 (8.20)
Marital status	
Married	31 (63.30)
Divorced	13 (26.50)
Widowed	2 (4.10)
Single	3 (6.10)
Occupation	
Employed	7 (14.30)
Unemployed	42 (85.70)
Presence of Co-assistants	
Yes, they have	32 (65.30)
No, they do not have	17 (34.70)
Children's Age	
4-6 years	24 (48.90)
7-9 years	18 (36.80)
10-13 years	7 (14.30)
Child Gender	
Male	25 (51.00)
Female	24 (49.00)
Comorbidities	
Does not have	12 (24.40)
Epilepsy	14 (28.60)
Visual impairment	6 (12.20)

Feeding difficulties	3 (6.20)
Mixed*	14 (28.60)
Nutrition Status	
Well-nourished	12 (24.50)
Moderate malnutrition	11 (22.40)
Severe malnutrition	26 (53.10)
CP Subtypes	
Spastic	41 (83.60)
Ataxic	2 (4.1)
Dyskinetic	2 (4.1)
Hypotonic	2 (4.1)
Mixed	2 (4.1)
GMFCS Level	
Level 2	8 (16.30)
Level 3	5 (10.20)
Level 4	6 (12.20)
Level 5	30 (61.30)

Footnote: symbol * = epilepsy and feeding difficulties; visual impairment and feeding difficulties; epilepsy and visual impairment; and epilepsy, visual impairment, and feeding difficulties.

The majority of the mother/caregivers aged of 25–39 years were 33 (67.4%), followed by 10 (20.4%) who were between the ages 40–54 and 6 (12.2%) who were younger than 25. In terms of the child's relationship, 45 (91.8%) were biological moms and 4 (8.2%) were other relatives (aunt, sister). Thirty-one were married (63.3%), 13 (26.5%) were single, and 2 (4.1%) were widowed. Of the participants, 42 (85.7%) were unemployed and only 7 (14.3%) were employed. In contrast to 17 (34.7%), 32 (65.3%) reported having co-caregivers to assist them. Nearly half of the children with CP were 4–6 years old (24; 48.9%), followed by 7–9 years old (18; 36.8%), and 10–13 years old (7; 14.3%). With 25 male (51.0%) and 24 female (49.0%) (Table 1).

Concerning comorbidities, 37 (75.6%) had at least one, whereas 12 (24.4%) had none. Epilepsy was reported in 14 (28.6%), visual impairment in 6 (12.2%), feeding difficulties in 3 (6.2%), and mixed comorbidities in 14 (28.6%). Only 12 (24.5%) were well-nourished, whereas 26 (53.1%) had severe malnutrition and 11 (22.4%) had moderate malnutrition, according to the nutritional evaluation. Regarding CP subtypes, spastic type was predominant (41; 83.6%), while ataxic, dyskinetic, hypotonic,

and mixed types each accounted for 2 (4.1%). The majority were at level V (severe impairment) 30 (61.3%), followed by level II (8; 16.3%), level IV (6; 12.2%), and level III (5; 10.2%), according to GMFCS (Table 1).

Status of anxiety level and sleep quality

Table 2
Magnitude of anxiety level and sleep quality among mothers

Characteristics	Frequency (Percentage), n = 49
Anxiety levels	
Normal	3 (6.20)
Mild	18 (36.80)
Moderate	21 (42.70)
Severe	7 (14.30)
Sleep quality	
Good quality	39 (79.50)
Mild	7 (14.30)
Moderate	3 (6.20)
Frequency of mothers wake up to help children's' needs	
Rarely	18 (36.70)
Frequently	31 (63.30)

Anxiety was highly prevalent. Only 3 mothers (6.2%) had anxiety scores that were normal. Eighteen (36.8%) had mild anxiety, 21 (42.7%) had moderate anxiety, and 7 (14.3%) had severe anxiety. As a result, 93.8% reported feeling anxious to some extent. Regarding sleep quality, 39 (79.5%) reported having good sleep, 7 (14.3%) had mild issues, and 3 (6.2%) had moderate issues. While 18 (36.7%) reported seldom getting up at night to care to their children's needs, 31 (63.3%) reported frequently waking up despite having pretty good sleep quality (Table 2).

Table 3
KMO and Bartlett's test of associated factors

KMO and Bartlett's test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.580
Bartlett's Test of Sphericity	Approx. Chi-Square	105.089
Total	df	55
	Sig	0.000

Principal Component Analysis (PCA) was used to determine the underlying structure of related factors. The sampling was marginally adequate, as shown by the Kaiser-Meyer-Olkin (KMO) value of 0.580. The correlation matrix was appropriate for factor analysis because Bartlett's Test of Sphericity was significant (Approximate Chi-Square = 105.089, df = 55, $p < 0.001$) (Table 3).

Table 4
Rotated component matrix of associated factors

	Component				
	1	2	3	4	5
Mother age	-0.807	-0.189	0.150	0.195	0.042
Relationship to child	0.830	-0.232	-0.205	-0.006	0.069
Marital status	0.806	-0.107	-0.348	0.067	0.047
Occupation	0.237	0.052	0.617	0.262	0.047
Presence of Co-caregivers	0.166	-0.130	0.017	0.691	0.500
Children's age	-0.293	-0.524	-0.375	0.315	-0.221
Child gender	0.148	-0.247	0.784	0.028	-0.156
Comorbidities	0.209	0.561	0.155	-0.373	0.029
Nutritional status	-0.363	0.604	-0.408	0.189	-0.065
CP subtypes	-0.288	-0.111	-0.015	-0.374	0.817
GMFCS level	0.124	0.719	0.095	0.478	0.071

Five components were identified using Principal Component Analysis (PCA) with Varimax rotation in order to investigate the underlying structure of the related factors. The sociodemographic traits of carers

were the main factors that loaded Component 1. This component represents caregiver-related characteristics, as seen by the strong positive loadings for relationship to child (0.830) and marital status (0.806). Clinical severity variables for children were represented by component 2. It was strongly loaded by GMFCS level (0.719), nutritional status (0.604), and the prevalence of comorbidities (0.561). This points to a cluster of functional severity and child health. The socioeconomic and demographic characteristics of the child and carer were reflected in Component 3, which was defined by occupation (0.617) and child gender (0.784). The presence of co-caregivers (0.691), which represents caregiving assistance, dominated Component 4. The CP subtypes (0.817) uniquely loaded Component 5, showing CP clinical type as a separate component (Table 4).

Table 5
Correlation between anxiety and sleep problem

Pearson correlation		Sleep problem
Anxiety	Correlation Coefficient	0.435**
	Sig. (2-tailed)	0.002

The association between anxiety and sleep issues among mothers and carers was investigated using Pearson correlation analysis. Anxiety and sleep issues were found to be somewhat positively and significantly correlated ($r = 0.435$, $p = 0.002$). This shows that among mothers and carers of children with cerebral palsy, sleep issues also markedly increased when worry levels rose (Table 5).

Table 6
Multivariable multiple linear regression model among associated factors

Variables	Anxiety		Sleep problem		VIF
	β	Sig.	β	Sig.	
Relationship to child	-0.206	0.319	-0.117	0.570	2.206
Marital status	0.117	0.571	0.199	0.337*	2.183
Occupation	0.146	0.343	-0.140	0.359	1.156
Presence of co-caregivers	0.240	0.100*	0.205	0.166*	1.113
Child gender	-0.035	0.818	-0.067	0.660	1.327
Comorbidities	-0.173	0.254*	-0.230	0.129*	1.160
Nutrition status	-0.059	0.755	0.092	0.548	1.475
CP subtypes	0.045	0.953	0.126	0.385	1.087
GMFCS level	0.186	0.245*	0.071	0.651	1.358
Model	F/Sig.	R ² /Adj R ²	F/Sig.	R ² /Adj R ²	
Regression	0.673 (0.728)	0.134 (-0.065)	0.849 (0.577)	0.164 (-0.029)	

A multivariable multiple linear regression analysis was performed to identify associated factors for anxiety and sleep problems. Nine variables were entered into the model, none of which had a significant $p < 0.05$ correlation with anxiety. The strongest association was seen with the presence of co-caregivers ($\beta = 0.240$, $p = 0.100$), followed by the level of the GMFCS ($\beta = 0.186$, $p = 0.245$) and the co-morbidity ($\beta = -0.173$, $p = 0.254$). The overall regression model was not statistically significant ($F = 0.673$, $p = 0.728$) and explained 13.4% of the variance in anxiety ($R^2 = 0.134$, corrected $R^2 = -0.065$). Similarly, in the sleep disorders, none of the independent variables reached statistical significance with $p < 0.05$. The beta coefficients were relatively higher for comorbidities ($\beta = -0.230$, $p = 0.129$), presence of co-caregivers ($\beta = 0.205$, $p = 0.166$), and marital status ($\beta = 0.199$, $p = 0.337$). The overall sleep problem model was also not significant ($F = 0.849$, $p = 0.577$), with $R^2 = 0.164$ and adjusted $R^2 = -0.029$. Multicollinearity was not a concern as all Variance Inflation Factor (VIF) values were below 2.5 (range 1.087 to 2.206), indicating no significant collinearity among independent variables (Table 6).

Factor influencing anxiety and sleep quality

The qualitative strand explored the lived caregiving experiences of 30 mothers of children with cerebral palsy (10 case, 10 controls, and 10 moderate), interviewed at Ubad Gargaar Special Needs Center

between June and July, 2026. Five interrelated themes were identified.

Theme 1: Demanding physical caregiving

Every participant reported having a significant physical load when performing daily tasks. Bathing, feeding, changing diapers, and helping with mobility were the most commonly mentioned difficulties. As P1 (Case) stated, *"Daily care (washing body and tooth brush); I feel a bit overwhelmed, and sometimes my own activities are disrupted because I'm taking care of my child,"* while P4 (Case) noted, *"When changing her diaper and bathing her body I am teaching my child to walk, so sometimes I find it hard and get tired of holding her."* According to P15 (Control), the load grew as the child became older and heavier: *"Changing diapers is also difficult at night, because he is already 9 years old now and sometimes, I struggle because of his bigger body size."*

Theme 2: Child sleep disruption and night-time caregiving

The quality of children's sleep varied by group, with 70% of parents saying their child sleeps well and 30% saying their child sleeps poorly. 57% of respondents said they woke up one to more than twice every night. Hunger, the need to change positions or diapers, urination, and discomfort from illness or suffering were the main causes. P7 (Case), for instance, reported awakening *"2 times only"* because of discomfort and illness, whereas P11 (Control) stated *"More than 2 times, he wakes up frequently at night to urinate."* Diaper care was frequently linked to waking in the Moderate group: *"But he usually wakes up 2 times, because I have to change his diapers"* (P30, Moderate).

Theme 3: Role overload and sacrifice of self-care

Significant disturbance to personal needs, employment, and household routines was reported by 80% of caregivers. Mothers said they neglected basic self-care in favor of spending all of their time with the child. *"I end up not being able to go anywhere,"* said P1 (Case). *I sometimes forget to eat or take a break because I'm so busy teaching my child range of motion.* At a similar vein, P3 (Case) reported, *"This really affects all of my activities, and even in the hardest moments I have to prioritize him over my 5 other children,"* and other participants from various groups said, *"I dedicate all of my time to taking care of my child"* (P8, Case; P29, Moderate; P30, Moderate). In the Case group, this sacrifice was more noticeable.

Theme 4: Caregiver anxiety, rumination, and impaired sleep

The groupings were distinguished by this main subject. Compared to 2 out of 10 mothers (20%) in the Control group, 8 out of 10 mothers (80%) in the Case group reported having bad sleep. Anxiety and continuous rumination were reported by case mothers. Both P3 (Case) and P4 (Case) stated, *"My sleep quality is very poor."* P8 (Case) revealed compound trauma: *"I have terrible sleep." I can't stop thinking about my daughter, who was murdered. Why did my family experience this? Poor her."* Another mother noted, *"I have been getting very poor sleep because I am anxious thinking about my child who was just hospitalized, about our lives, and I am afraid of my child's illness relapsing"* (P10, Case). Child illness, future-focused anxiety (*"Sometimes my sleep is disturbed because I always think about what will happen*

to my family in the future") (P6, Case), and financial strain ("Caring for my child while facing the economic difficulties I'm going through") (P28, Moderate) were all triggers for worsening sleep. Mothers in the control group, on the other hand, showed resilience and the capacity to get back asleep: "Although I frequently wake up to assist my child in changing positions, I am still able to fall back asleep." "I feel that my sleep pattern is good" (P11, Control), "I sleep fine, because I'm used to going to bed early" (P16, Control), and "I do not have sleep problems" (P12, Control).

Theme 5: Protective factors and coping strategies

Protective factors that enhanced sleep and decreased anxiety were found by half of the individuals. These included stable child health, crucial family support, and cognitive reframing via maternal acceptance. "Sometimes when I have a lot of work to finish, I ask my other children to help him" (P2, Case) and "I share the role with my husband to help watch over our child while he sleeps at night" (P13, Control) were examples of supporting statements. "I feel well because my child's health is also good right now" (P11, Control) and "Because my child is also in good condition" (P15, Control) are two examples of how control mothers commonly connected their children's well-being to getting enough sleep. "I see the burden of caring for my child as my responsibility as a mother" (P19, Control) and "I don't feel burdened by caring for my child" were examples of acceptance-based coping. "I effectively handle all of my responsibilities" (P18 and P19, Control). Sleep quality was characterized as conditional in the Moderate group: "My sleep quality depends on how my child is doing" (P24, Moderate).

Collectively, the qualitative results show a loop in which physically difficult caregiving and nighttime caregiving lead to role overload, which in turn causes anxiety and restless nights, especially when family support is scarce and exacerbated by outside pressures. Acceptance, stable child health, and shared caring all seem to act as mediators of resilience.

Why moderate anxiety does not impair sleep in the moderate group

A notable finding emerged in the Moderate group (P21-P30): despite reporting moderate levels of anxiety, 50% reported good sleep quality and 50% mixed, with none reporting severe sleep impairment as seen in the Case group (80% poor). Four protective mechanisms are used by the qualitative data to explain this dissociation:

Theme 1: Conditional, nor ruminative anxiety

Anxiety in the Moderate group is situational and depends on child health, in contrast to the Case group, where anxiety is widespread and ruminative ("I always think about what will happen to my family in the future" (P6, Case), "I keep thinking about my daughter who was killed" (P8, Case). P24 (Moderate) made it clear that "My sleep quality depends on how my child is doing." Anxiety is cognitively present in healthy children, but it does not cause hyperarousal before bed. The Moderate group lacks the sustaining aspect of rumination but has predisposing anxiety.

Theme 2: Effective co-regulation and family support

Mothers in the moderate group often talked about sharing nighttime caring, which prevents anxiety from interfering with sleep. In Control/Moderate patterns: *"I share the role with my husband to help watch over our child while he sleeps"* (P13, Control pattern also presents in Moderate), but P23 (Moderate) claimed *"I have never found my child waking up at night"* as a result of shared care. The Case group, on the other hand, stated: *"Because my child is sick and I'm the only one helping"* (P3, Case). Social support reduces physiological hyperarousal and maintains sleep even in the face of cognitive anxiety.

Theme 3: Adaptive sleep hygiene and acceptance coping

"I always go to bed early" (P29, Moderate), *"She is trying to adapt to sleeping for 4 hours, but it is effective"* (P30, Moderate), and *"I feel that handling my child is much easier now"* (P25, Moderate) are examples of deliberate sleep habits that Case women did not exhibit. *"In my current condition, I can handle my child well, so there are no meaningful difficulties"* (P23, Moderate) reframes their fear as controllable. While the Case group exhibits catastrophic worry about relapse, this acceptance coping lessens somatic anxiety: *"I am afraid of my child's illness relapsing"* (P10, Case).

Theme 4: Cultural and contextual factors at Ubad Gargaar

In the Somaliland environment, mild anxiety may not be indicative of clinical hyperarousal but rather of true economic stress (*"Caring for my child while facing the economic difficulties"* (P28)). *"He doesn't disturb my activities too much"* (P26, Moderate) is how these mothers continue to be functional. Their anxiousness is not dysfunctional (it keeps them from sleeping), but rather instrumental (it inspires care).

This lends credence to the Transactional Model of Stress, which holds that sleep outcomes are determined by coping mechanisms and assessment rather than just anxiety levels. This indicates that the Moderate group at Ubad Gargaar may benefit most from an intervention that focuses on sleep hygiene, shared caring, and rumination reduction (rather than just anxiety reduction) to stop the development of poor sleep.

DISCUSSION

The purpose of this mixed-methods study was to evaluate the anxiety and sleep quality of primary caregivers of children with cerebral palsy (CP) at the Ubad Gargaar Special Needs Center in Somaliland, as well as to investigate the lived experiences that underlie these results. A complicated picture emerges from the integration of quantitative and qualitative strands: extremely high anxiety coexists with subjectively preserved sleep, protected by family support and cultural acceptability, but susceptible to the demands of nighttime caregiving.

Sociodemographic and clinical profile: a vulnerable population

The severe end of the CP spectrum observed in low-resource settings is reflected in the profile of our sample, which includes 67.4% of primary caregiver aged 25 to 39, 91.8% biological mothers, 85.7% of

mothers were unemployed, 61.3% children at GMFCS Level V, 75.6% with at least one comorbidity, and 75.5% with moderate-to-severe malnutrition. Based on a study conducted in northern Ghana [25], most caregivers were between the ages of 30 and 39 (76%) while children were between the ages of 2 and 4 (77%). According to an Ethiopian study [4, 6], 53.8–59.8% of children had severe impairments (GMFCS level V). Thirty of the 174 children evaluated had two related deficits, and 144 had three or more. Caregivers who occupied as housewife (76.2%) and unemployed (46.1%) reported in Eritrean and Ethiopian studies [4, 5]. Housewives made up 76.2% of caregivers, as reported by Eritrean research [5]. In low- and middle-income countries (LMICs), such as Bangladesh, Indonesia, and Nepal, the percentage of moderate-to-severe underweight children with CP ranged from 52 to 89%, whereas in Ghana, it was 39%. The ranges for moderate-to-severe stunting and thinness were 64–93% and 29–36%, 51% and 24%, respectively [11].

Referral bias emphasizes severe patients in Ubad Gargaar. "Changing diapers is also difficult at night, because he is already 9 years old" (P15) is a qualitative description of the physical caregiving burden, which is directly explained by the high prevalence of spastic quadriplegia (83.6%) and epilepsy (28.6%). Component 2 loaded GMFCS (0.719), nutrition (0.604), and comorbidities (0.561) collectively, indicating a severity cluster where motor impairment, malnutrition, and comorbidity co-occur and compound caregiver needs, according to PCA results.

Magnitude of anxiety among primary caregivers

Only 6.2% of mothers had normal anxiety scores, while 42.7% had moderate and 14.3% severe anxiety. Compared to parents of children with usual development, parents of children with cerebral palsy experience anxiety more frequently. Mothers who faced problems such as stigmatization and social disengagement due to their children's illness were associated with higher support needs (including swallowing safety, growth, nutrition, illness, death, and the child's future quality of life (QoL)) [24, 32, 33]. According to a Turkish study, 46.6% of mothers reported having worry, which was found to be higher since impaired children could be seen as a major source of disappointment in the family. Additionally, the care of disabled children with limited daily activities can negatively impact family relations, cause family members' roles to alter, and require family members to take on new duties connected to the care of CP children [34].

According to our research, this is related to three factors: First, there are no official support systems. Unlike studies where caregivers had access to respite care, 34.7% of our participants had no co-caregiver (PCA Component 4). *"Because my child is sick and I'm the only one helping"* (P3) was verified by qualitative data. Second, caregiving is full-time and unpaid due to 85.7% unemployment, as P28 said, *"Caring for my child while facing the economic difficulties."* Third, stigma and trauma were exacerbated in Somaliland. The disclosure *"I keep thinking about my daughter who was killed"* (P8) suggests that CP caring and past trauma overlap, inflating GAD-7 scores. In Somaliland, disability is culturally linked to spiritual causes, which makes married women (63.3% of the sample) who are solely responsible feel more alone.

The paradox of good subjective sleep despite many nighttime awakenings

Quantitatively, 79.5% of respondents stated their sleep was of high quality, although 63.3% claimed they regularly woke up to attend to their children's needs. The qualitative strand resolves this apparent conflict. Anxiety and sleep issues were significantly positively correlated, according to the Pearson correlation ($r = 0.435$, $p = 0.002$), consistent with a Chinese study and a cross-sectional study conducted in Tunisia, there were substantial correlations between anxiety and poor sleepers ($p < 0.01$, $p = 0.001$, respectively). Sleep-onset insomnia is often caused by anxiety. The association between anxiety and sleep quality was partially mediated by social support. This implies that parents of special children who experience higher levels of worry will have poorer sleep quality, but higher levels of social support will mitigate the negative effects of anxiety on sleep quality [16, 17]. Furthermore, the health-related quality of life (HRQOL) of main caregivers with inadequate sleep was 43% lower (p -value = 0.000) [15]. However, because mothers can distinguish between awake and poor sleep, the mean sleep score remained low. P12 (Control) explained: *"Although I often wake up to help my child change position, I am still able to fall back asleep. I do not have sleep problems."*

The results of the study contradict the claim that insomnia is substantially predicted by nighttime awakenings. (a) Adaptive sleep hygiene—*"I always go to bed early"* (P16, P29) and *"I am trying to adapt to sleeping for 4 hours, but it is effective"* (P30), which reflect Somaliland's early bedtime culture—and (b) Acceptance coping—Component 1 in PCA (relationship to child: 0.830, marital status: 0.806) reflects caregiver identity—emerged in our Moderate and Control groups. By reframing load as normal, statements such as *"I see the burden as my responsibility as a mother"* (P19) lessen hyperarousal.

Our comprehensive analysis explains the Moderate group finding, which is moderate anxiety but retained sleep. Moderate group anxiety is conditional: *"My sleep quality depends on how my child is doing"* (P24), in contrast to the Case group (80% bad sleep, ruminative worry: *"I always think about what will happen to my family"*). Model of insomnia states that the moderate group possesses protective co-regulation (e.g., *"I share the role with my husband"*) and predisposing anxiety but lacks persistent rumination (P13). Therefore, anxiety does not lead to hyperarousal.

Why did associated factors not-predict in a non-significant regression model?

Only 13.4% of the variation in anxiety ($R^2 = 0.134$, $F = 0.673$, $p = 0.728$) and 16.4% of the variance in sleep ($R^2 = 0.164$, $F = 0.849$, $p = 0.577$) could be explained by multivariable regression; no variable reached $p < 0.05$, and multicollinearity was removed when $VIF < 2.5$. Despite being unexpected at first, this non-significance is instructive:

(a) The sample's homogeneity—91.8% mothers, 85.7% unemployed, and 83.6% spastic CP—reduces predictive power. (b) Measurement limitation: While anxiety and sleep were quantified as outcomes,

qualitative themes such as social support quality, trauma history, and rumination emerged as important but were not included in the quantitative instrument. The sample size ($n = 49$) was insufficient for stable factor structure, according to PCA with KMO 0.580 (marginally suitable); Bartlett significant, but KMO < 0.6 shows the requirement for $n > 100$. (c) Cultural measurement bias: When women normalize waking as part of their maternal responsibilities, sleep quality's instrument may underestimate sleep issues.

Despite statistical non-significance, the trend-level signals—co-caregiver present ($\beta = 0.240, p = 0.100$ for anxiety; $\beta = 0.205, p = 0.166$ for sleep) and comorbidities ($\beta = -0.230, p = 0.129$)—converge with qualitative evidence and are clinically important. In line with Theme 5, mothers without co-caregivers experienced higher levels of worry.

Mixed-methods integration and theoretical contribution

Both convergence and divergence are shown in the mixed-methods integration through joint presentation. There was convergence in the relationship between anxiety and sleep, as the quantitative strand found a substantial association with an anxiety prevalence of 93.8%. However, there was divergence in the mechanism, which was clarified by the qualitative findings that show how this correlation is buffered.

Obbarius et al.'s modified Transactional Model is used to interpret this result. Personal Resources (Sense of Coherence, Self-Efficacy, and Optimism) and Environmental Stressors (Perceived Stressors) are the causal antecedents in their structural model, which was validated in 2,216 psychosomatic inpatients; Coping is the mediating process; Stress Response (affective-emotional response operationalized as Worries, Tension, and Low Joy) is the immediate effect; and Psychological Well-being (Depression) is the long-term effect. Importantly, they discovered that resources and perceived stressors accounted for 91% of the variance in stress response. The attenuating effect of resources on stress response (standardized $\beta = -0.73$) was more than twice that of perceived stressors ($\beta = 0.34$), and stress response itself accounted for 63% of depression [35].

Building on this, we suggest the Ubad Gargaar Model of Caregiver Resilience as a culturally based adaptation for high-stigma, low-resource situations. Severe CP (GMFCS V, malnutrition, and comorbidities) serves as the Environmental Stressor in our model, resulting in high physical demand, role overload, and nighttime awakenings. Anxiety is the result, and in Obbarius' concept, this is equivalent to the Stress Response. The Transactional Model's basic thesis—that stress is a highly personalized person-environment transaction—is illustrated by two routes that arise from worry.

1. Pathway (i) denotes reduced personal resources, where anxiety leads to poor sleep quality as a long-term impact on wellbeing in the absence of co-caregiver support and with ruminative coping.
2. Pathway (ii)—which includes a co-caregiver, acceptance, and an early bedtime—represents enhanced Personal Resources that directly reduce perceived stresses and diminish the stress response, preserving sleep despite ongoing worry (Control/Moderate). By operationalizing Personal Resources as relational and cultural resources, such as co-caregiving and Ubad Gargaar, which are

more potent than the stressor itself in shaping caregiver outcomes, our approach thereby expands Lazarus and Folkman's paradigm (Case).

Implications

1. Theoretical implication

The modified Transactional Model by Obbarius et al. is validated and culturally extended in this study. While Obbarius discovered that 91% of the variance in Stress Response was explained by Personal Resources (Sense of Coherence, Self-Efficacy, and Optimism) with $\beta = -0.73$ versus $\beta = 0.34$ for stressors, we show that in Somaliland, Personal Resources are not only internal characteristics but also relational and cultural: co-caregiver availability (PCA Component 4), maternal acceptance ("*I see the burden as my responsibility as a mother*"), and the cultural value of Ubad Gargaar (caring for children in need). This explains the disparity in the combined display: the qualitative explanation explains how correlation is buffered, while the quantitative explanation reveals correlation. The Ubad Gargaar Model thereby reframes resilience from individual to collective.

1. Clinical and public health implication

1. Screening should be dyadic: GAD-7 screening for caregivers, particularly for GMFCS V and malnourished children (severity cluster Component 2), should be a regular part of physiotherapy visits
2. Instead of focusing just on reducing anxiety, the intervention should focus on reducing rumination and improving sleep hygiene. Our results indicate that the moderate group-maintained sleep because they refrained from ruminative coping, not because they were less nervous. Co-caregiver scheduling, 4-hour sleep adaptation, and early bedtime culture are all low-cost and culturally acceptable brief interventions
3. Training for family-centered co-caregivers: 34.7% received no assistance. Maternal sleep can be directly protected by teaching fathers, grandmothers, and older siblings to share diaper changes and repositioning at night.

1. Policy implication

One of Somaliland's few centers is Ubad Gargaar. Given the 75.5% malnutrition rate, the findings support: i) formalizing respite care and home visits by community health workers; ii) integrating nutritional rehabilitation with caregiver mental health; and iii) creating anti-stigma campaigns that reframe disability from spiritual cause to preventable condition to lessen isolation.

Strengths and Limitations

This study has several noteworthy advantages despite its shortcomings. To the best of our knowledge, it fills a significant evidence gap in low- and middle-income nations by being the first mixed-methods study on the burden of caring for people with cerebral palsy in Somaliland. One important strength was the

implementation of an explanatory sequential design with joint display integration, which helped us explain the buffering mechanism through qualitative observations and resolve the quantitative conundrum of extremely high anxiety (93.8%) while maintaining subjective sleep (79.5%). In order to achieve data saturation, we used purposive maximum-variation sampling (10 Case with high anxiety and poor sleep, 10 Control with low anxiety and good sleep, and 10 Moderate with moderate anxiety and good sleep) combined with whole population sampling to maximize statistical power in a small accessible population. Furthermore, the study provides a theoretical contribution by developing the Ubad Gargaar Model of Caregiver Resilience, which is based on Obbarius et al.'s empirically validated modified Transactional Model. In addition, instruments were culturally adapted and translated in accordance with WHO guidelines with pilot testing, including a caregiver-specific sleep item capturing nighttime care disruption.

There are drawbacks to this study as well. First, the sample was small and single center ($n = 49$ quantitative, $KMO = 0.580$ barely acceptable and < 0.6), which restricts generalizability beyond Ubad Gargaar, reduces PCA stability, and makes the multivariable regression models underpowered and non-significant. Second, it is unable to demonstrate a causal relationship between anxiety and sleep quality due to the cross-sectional design. Third, there are measurement limitations: the internal consistency was moderate for PROMIS Sleep ($\alpha = 0.579$) and acceptable for GAD-7 ($\alpha = 0.701$); no objective sleep measures, such as actigraphy, were used; audio recording was not done to ensure confidentiality; instead, field notes and transcription were used, which may have reduced verbatim richness; and cultural measurement bias persists where mothers normalize nighttime waking as part of maternal responsibility. Fourth, despite the lack of multicollinearity ($VIF < 2.5$), the sample's high homogeneity (91.8% biological mothers, 85.7% unemployed, and 83.6% spastic CP) decreased variance for predictive modeling. Finally, confessions of past trauma outside of CP caregiving, such as "*daughter who was killed*," suggest that social desirability and trauma confounding may have elevated anxiety levels. This suggests that GAD-7 may reflect broader distress in this high-adversity environment.

CONCLUSION

The caregiver community of Ubad Gargaar is both vulnerable and resilient, according to this mixed-methods study. Many people retain good subjective sleep through acceptance, early bedtime, and shared caregiving, even though worry is almost universal and highly connected with sleep disturbance ($r = 0.435$). The non-significant regression emphasizes that lived experience, rumination, and support quality are more important in explaining caregiver outcomes in this situation than traditional sociodemographic and clinical characteristics alone.

Future studies must validate the Ubad Gargaar Model and use bigger, multi-center longitudinal designs using objective sleep metrics. Practically speaking, co-caregiver mobilization, rumination-focused counseling, and sleep hygiene should be given top priority in Ubad Gargaar therapies as quick, inexpensive ways to safeguard caregiver wellbeing while tending to children with severe cerebral palsy.

ABBREVIATIONS

ASD	
Autism Spectrum Disorder	
ADHD	
Attention-Deficit/Hyperactivity Disorder	
CP	
Cerebral Palsy	
GAD-7	
Generalized Anxiety Disorder 7-item scale	
GMFCS	
Gross Motor Function Classification System	
HMIS	
Health Management Information System	
HRQOL	
Health-related Quality of Life	
IRB	
Institutional Review Board	
KMO	
Kaiser-Meyer-Olkin	
LMICs	
Low- and Middle-Income Countries	
NDDs	
Neurodevelopmental Disorders	
PB	
Parental Burnout	
PCA	
Principal Component Analysis	
PROMIS	
Patient-Reported Outcomes Measurement Information System	
QoL	
Quality of Life	
SPSS	
Statistical Package for Social Sciences	
VIF	
Variance Inflation Factor	
WHO	
World Health Organization	

DECLARATIONS

Ethical Considerations

The Edna Adan University Ethics Committee granted ethical approval for this study (IRB No. 158/2026). The Declaration of Helsinki's ethical guidelines were followed when conducting the study. Prior to participation, each subject provided written informed permission in Somali. The goal of the study, its voluntary nature, the possibility to withdraw at any time without affecting services obtained at Ubad Gargaar Center, and confidentiality safeguards were all described in the permission form. To protect participant privacy and confidentiality—especially considering the revelation of delicate trauma experiences—no audio recording was done; instead, comprehensive field notes and verbatim transcriptions were created, with member verification for accuracy. All information was de-identified, kept on encrypted drives, and only the research team could access it. During interviews, participants who were experiencing extreme anxiety were sent to the center's counseling services.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Author Contribution

In addition to conceiving and designing the study and carrying out data collecting, analysis, and writing, PG assumed complete responsibility for assessing and refining the manuscript into a publishable manner. Data collection (clinical evaluation of GMFCS, CP subtypes, and nutritional assessment) and study on children with cerebral palsy were financed by HKA and AMA. JJR led conversations and collected information about nutrition for children with cerebral palsy.

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Data Availability

The dataset used and analysed during the current study is available from the corresponding author on reasonable request.

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