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Original Article

Assessment of Quality of Life in CP Children of 4–12 Years of Age in Lahore

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ABSTRACT

Background: Cerebral palsy is a non-progressive disorder of the developing brain associated with persistent disturbances of movement, posture, activity, participation, and broader psychosocial well-being. Assessment of quality of life provides information beyond motor impairment by incorporating the child's physical, emotional, social, functional, and family-related experiences. Objective: To assess caregiver-reported quality of life among children with cerebral palsy aged 4–12 years in Lahore using the CP QOL-Child proxy-report questionnaire. Methods: An analytical cross-sectional study was conducted at the Pakistan Society for Rehabilitation of the Differently Abled from April to August 2024. Purposive sampling was used to recruit 102 eligible children with cerebral palsy. Caregivers completed the 66-item CP QOL-Child proxy-report questionnaire. Scores were transformed to a 0–100 scale and summarized using descriptive statistics. Internal consistency was assessed using Cronbach's alpha. Results: The mean participant age was 7.1 ± 1.9 years; 54 (52.9%) participants were male and 48 (47.1%) were female. The overall CP-QOL score was 47.92 ± 19.98. Family health had the highest domain mean (55.49 ± 18.78), followed by social well-being and acceptance (52.41 ± 18.65), whereas feelings about functioning had the lowest mean (32.92 ± 23.76). Male and female mean scores were 49.18 ± 16.48 and 46.49 ± 15.30, respectively. Overall internal consistency was acceptable ($\alpha = 0.720$), although substantial variation was present across component groupings. Conclusion: Quality-of-life scores varied considerably across domains, with comparatively lower scores in feelings about functioning and participation. Comprehensive assessment of children with cerebral palsy should therefore extend beyond motor impairment to encompass functional, psychosocial, participation, family, and service-related dimensions. Key Words: Cerebral Palsy, Quality of Life, Cerebral Palsy Quality of Life Questionnaire.

INTRODUCTION

Cerebral palsy (CP) comprises a heterogeneous group of permanent disorders of movement and posture resulting from disturbances occurring in the developing fetal or infant brain. Although the underlying neurological injury is non-progressive, its manifestations may evolve throughout childhood as growth, musculoskeletal development, environmental demands, and functional expectations change. Motor abnormalities may include disturbances of muscle tone, coordination, balance, posture, selective motor control, and voluntary movement, while associated impairments can involve cognition, communication, sensation, behavior, epilepsy, and other neurological or musculoskeletal complications. Consequently, the burden of CP extends considerably beyond the primary motor disorder and may influence independence, educational participation, social interaction, family functioning, and access to rehabilitation throughout childhood (1). Evidence from Pakistan has similarly demonstrated the substantial clinical and functional burden of CP among affected children, emphasizing the importance of evaluating

outcomes that reflect children's broader lived experiences rather than relying exclusively on impairment-based clinical measures (2).

The clinical heterogeneity of CP is particularly important when considering quality of life (QOL). Traditional assessment has often concentrated on neurological impairment, gross motor function, spasticity, deformity, mobility, or dependence in activities of daily living. These outcomes are clinically valuable but do not fully represent how children experience their health, relationships, participation, emotional well-being, pain, communication, and interaction with their physical and social environments. Quality of life provides a multidimensional framework through which these broader consequences can be examined. Parent-reported research involving children with CP has demonstrated that physical impairment interacts with psychosocial, environmental, family, and participation-related factors, and that parental perspectives can provide important information regarding domains that may not be adequately captured during routine clinical evaluation (3). Children with substantial motor limitations may nevertheless experience meaningful social and emotional well-being, reinforcing the distinction between impairment severity and subjective or proxy-reported quality of life (4).

The importance of this multidimensional perspective is particularly evident in low- and middle-income countries, where disability may occur within environments characterized by variable access to rehabilitation, assistive technologies, special education, accessible transportation, trained health professionals, and social support. A systematic review of health-related quality of life among children and adolescents with CP in low- and middle-income settings identified physical well-being as one of the most adversely affected dimensions and demonstrated that poorer motor function was associated with poorer physical aspects of health-related quality of life (5). Pakistani evidence has likewise indicated that physical activities and health are among the weaker dimensions of parent-reported health-related quality of life in children with CP, suggesting that functional restrictions are accompanied by broader effects on children's day-to-day experiences (6). These findings underline the need for locally generated multidimensional QOL data because patterns identified in high-resource settings cannot automatically be assumed to represent children living within different rehabilitation, educational, socioeconomic, and family environments.

Recent Pakistani research provides an emerging but still limited evidence base regarding QOL in children with CP. Hanif and colleagues assessed children with CP in Islamabad using the CP-QOL instrument and reported generally reduced quality-of-life scores, with particularly unfavorable findings among children with quadriplegic involvement and among female participants in their sample (7). Iram and colleagues evaluated socioeconomic status in relation to quality of life among children with CP attending government hospitals and special training centers and found no overall significant association between socioeconomic status and QOL, although socioeconomic patterns were related to selected aspects of pain and disability (8). Participation is another important component of childhood well-being. Javed and colleagues reported restricted participation among Pakistani adolescents with CP across several domains, with particularly limited engagement in work-related and future-planning activities (9). Together, these studies demonstrate that QOL in CP is not determined by a single clinical characteristic but reflects interactions among functional capacity, participation, environmental opportunity, family circumstances, and access to supportive services.

Physical activity and functional mobility are closely connected to children's ability to participate in ordinary developmental experiences, but their relationship with subjective QOL is complex. In children with CP aged five years, Keawutan and colleagues reported better parent-reported QOL among ambulant children than among non-ambulant children in domains related to feelings about functioning, while habitual physical activity itself was not independently associated with parent-reported QOL (10). This distinction is clinically important because increasing activity alone may not necessarily translate into improvements across every QOL domain. The Finnish CP QOL-Child experience similarly demonstrated inverse relationships between functional classification severity and QOL, while pain was identified as an important contributor to poorer quality of life and participation restrictions (11). Such findings support the use of multidimensional assessments that can differentiate children's functional experiences from emotional, social, family, service-related, and pain-related concerns.

Measurement of QOL in children with CP presents additional methodological challenges because physical, cognitive, communication, and developmental limitations may affect a child's ability to complete self-report measures independently. The CP QOL-Child was developed specifically to capture quality-of-life dimensions

relevant to children with CP and is available in caregiver proxy-report and child self-report forms for appropriate age ranges. Construct-validity research has supported the multidimensional structure of the caregiver proxy-report instrument and its applicability across cultural settings (12). Earlier work on measurement of quality of life in children with CP likewise emphasized the value of disease-specific instruments in characterizing physical and psychosocial well-being while recognizing the methodological importance of proxy assessment when independent child reporting is difficult (13). Use of the CP QOL-Child in an Indian pediatric population further demonstrated its feasibility for examining several dimensions of QOL in a regional context with health-system and sociocultural features that may share relevance with Pakistan (14).

Proxy reporting is nevertheless not interchangeable with a child's own subjective assessment. Parents and caregivers directly observe many aspects of daily functioning, pain behavior, participation, service access, dependence, and family impact, but their ratings can also reflect caregiver stress, expectations, coping mechanisms, and perceptions of disability. European research found that parent-reported QOL among children with CP was associated with multiple child and family characteristics, highlighting the need to interpret caregiver ratings as a meaningful but distinct perspective on the child's quality of life (3). Differences between child- and caregiver-reported QOL have also been described in other settings, with caregivers sometimes assigning lower ratings than children themselves, particularly for domains affected by visible functional limitations (11). Proxy reporting therefore has greatest interpretive value when viewed as an assessment of caregiver-perceived child QOL rather than as a perfect substitute for the child's subjective experience.

Pain, disability-related burden, family health, social participation, and access to services can further shape the everyday experience of CP. Research from rehabilitation settings has demonstrated that CP imposes substantial demands not only on affected individuals but also on caregivers, whose physical, psychological, social, and economic well-being may be affected by the intensity and duration of caregiving responsibilities (15). Family circumstances are therefore relevant to child-centered QOL assessment because children's opportunities for rehabilitation, education, communication, recreation, and social participation frequently depend on caregiver resources and support. Indonesian evidence has similarly identified child, family, clinical, and contextual factors as potential contributors to health-related quality of life among children with CP, reinforcing the need to evaluate QOL within the broader environment in which disability is experienced (16).

Despite the growing international literature, there remains a need for context-specific evidence describing multiple dimensions of quality of life among Pakistani children with CP, particularly within rehabilitation settings where children may present with diverse functional profiles and family circumstances. Existing Pakistani studies have contributed valuable information on overall QOL, physical health, socioeconomic factors, and participation (6–9), but additional local data are useful for determining which caregiver-reported domains appear comparatively most affected and which aspects of children's lives warrant greater attention during comprehensive rehabilitation assessment. Accordingly, the present study aimed to assess caregiver-reported quality of life among Pakistani children with cerebral palsy aged 4–12 years attending a rehabilitation setting in Lahore using the CP QOL-Child proxy-report questionnaire.

MATERIALS AND METHODS

An analytical cross-sectional study was conducted at the Pakistan Society for Rehabilitation of the Differently Abled (PSRD), Lahore, Pakistan, over a five-month period from April to August 2024. The target population comprised children with cerebral palsy aged 4–12 years attending the study setting. A purposive, non-probability sampling technique was used. Of 126 children assessed for eligibility, 102 fulfilled the study eligibility criteria and were included in the analysis. The calculated study sample was 102 participants, based on the sample-size approach described in the study protocol using Slovin's formula.

Children aged 4–12 years with cerebral palsy were eligible when a parent or primary caregiver was present and able to participate in proxy assessment. Children outside the prespecified age range were excluded. The study population was restricted to children with cerebral palsy according to the stated eligibility framework, and caregiver availability at the time of assessment was required because the selected QOL instrument was administered as a caregiver proxy report. These criteria were applied to maintain consistency between the age range of interest, proxy-report methodology, and study objective.

Before data collection, consent was obtained from the participating child's caregiver. The assessment was based on the caregiver proxy-report version of the Cerebral Palsy Quality of Life Questionnaire for Children (CP QOL-Child), a disease-specific instrument developed to assess quality of life among children with CP. Disease-specific QOL instruments are useful in this population because they encompass dimensions relevant to the functional, psychosocial, participation-related, pain-related, family, and service experiences of children with cerebral palsy (12–14). The caregiver proxy approach was selected for children aged 4–12 years, consistent with the population assessed in the present study.

The questionnaire contained 66 items and generated information across nine reported QOL components: social well-being and acceptance, participation, communication, physical health, feelings about functioning, emotional well-being and self-esteem, access to services, pain and impact of disability, and family health. These dimensions were retained separately during descriptive analysis to avoid reducing the multidimensional nature of quality of life to a single global construct. The inclusion of functional and psychosocial components is consistent with evidence demonstrating that children with CP may experience different levels of well-being across physical, emotional, social, participation, and family-related domains (3,11–14).

Most questionnaire items were rated on a nine-point response scale. For applicable satisfaction-oriented items, responses ranged from 1 to 9, with anchors corresponding to progressively more favorable ratings. Items addressing constructs such as pain or distress used wording appropriate to the construct being measured. Nine-point responses were transformed to a standardized 0–100 metric according to the instrument scoring approach: scores of 1, 2, 3, 4, 5, 6, 7, 8, and 9 corresponded to transformed values of 0, 12.5, 25.0, 37.5, 50.0, 62.5, 75.0, 87.5, and 100, respectively. For questionnaire items based on a five-point response format, scores of 1, 2, 3, 4, and 5 were transformed to 0, 25, 50, 75, and 100, respectively. Domain scores were subsequently calculated using the applicable item scores.

The questionnaire was administered in English. During data collection, questions were verbally translated or explained to caregivers when necessary to facilitate comprehension. Responses were obtained from parents or caregivers rather than directly from the children, and interpretation of the resulting scores therefore reflects caregiver-perceived QOL. This distinction is relevant because proxy and self-reported QOL may differ, particularly for subjective psychosocial domains (3,11). Nevertheless, caregiver proxy assessment remains important when developmental, communication, or functional limitations restrict independent completion by younger children or by children with more substantial disability (12,13).

Data were analysed using IBM SPSS Statistics version 29.0. Continuous measures were assessed for distributional normality using the Shapiro–Wilk test. As the analysed QOL measures were treated as approximately normally distributed, continuous data were summarized as mean ± standard deviation (SD), with minimum and maximum values presented for individual CP-QOL domains where available. Categorical demographic variables were summarized as frequencies and percentages. Domain-level and overall CP-QOL scores were calculated on the standardized 0–100 metric.

Internal consistency was evaluated using Cronbach's alpha. Cronbach's alpha was interpreted as an index of internal consistency rather than as evidence of construct validity. Reported coefficients were retained for the component groupings available from the statistical analysis, together with the overall scale coefficient. Because the supplied statistical results did not include inferential comparisons, p-values, confidence intervals, or test statistics for age- or sex-based differences, interpretation of these participant characteristics was restricted to descriptive comparisons. No causal interpretation was applied because the cross-sectional study design measured QOL and participant characteristics at a single observational time point.

RESULTS

Of the 126 children assessed for eligibility, 102 met the study criteria and were included in the analysis, corresponding to 81.0% of those initially assessed. Among the included participants, 54 (52.9%) were male and 48 (47.1%) were female. Mean age was 7.1 ± 1.9 years. Nine children (8.8%) were aged 4–6 years, 55 (53.9%) were aged 7–9 years, and 38 (37.3%) were aged 10–12 years. The largest proportion of participants therefore belonged to the 7–9-year age group. Diplegic cerebral palsy was described as the most frequently represented clinical pattern,

whereas comparatively few participants were described as having hemiplegic involvement; subtype-specific counts were not used in quantitative comparisons.

Table 1. Demographic Characteristics of the Study Participants (N = 102)

Characteristic	n (%) or Mean ± SD
Age, years	7.1 ± 1.9
4–6 years	9 (8.8)
7–9 years	55 (53.9)
10–12 years	38 (37.3)
Male	54 (52.9)
Female	48 (47.1)

Across the nine CP-QOL domains, mean scores ranged from 32.92 to 55.49. Family health demonstrated the highest mean domain score at 55.49 ± 18.78, followed by social well-being and acceptance at 52.41 ± 18.65, access to services at 50.71 ± 16.37, and physical health at 50.66 ± 15.93. Pain and impact of disability had a mean score of 48.86 ± 20.60, communication 47.64 ± 24.38, and emotional well-being and self-esteem 47.52 ± 17.58. Lower mean values were observed for participation (45.04 ± 23.80) and, most notably, feelings about functioning (32.92 ± 23.76). The overall CP-QOL score was 47.92 ± 19.98.

Table 2. Descriptive Statistics for CP-QOL Domains and Overall Quality-of-Life Score

CP-QOL Domain	Minimum	Maximum	Mean ± SD
Social well-being and acceptance	16.40	89.06	52.41 ± 18.65
Participation	0.00	87.50	45.04 ± 23.80
Communication	0.00	87.50	47.64 ± 24.38
Physical health	18.75	85.15	50.66 ± 15.93
Feelings about functioning	0.00	79.17	32.92 ± 23.76
Emotional well-being and self-esteem	15.00	87.50	47.52 ± 17.58
Access to services	9.72	94.45	50.71 ± 16.37
Pain and impact of disability	18.75	90.62	48.86 ± 20.60
Family health	17.50	87.50	55.49 ± 18.78
Overall CP-QOL score	—	—	47.92 ± 19.98

The relatively broad SDs and score ranges in several domains indicate substantial heterogeneity in caregiver-reported experiences within the study population. Participation ranged from 0 to 87.50, communication from 0 to 87.50, and feelings about functioning from 0 to 79.17. In contrast, the observed physical-health range was narrower, from 18.75 to 85.15. These descriptive distributions suggest that participants differed considerably in how caregivers perceived specific dimensions of quality of life, even within the same diagnostic population. When overall CP-QOL scores were examined descriptively by sex, males had a mean score of 49.18 ± 16.48 and females had a mean score of 46.49 ± 15.30. The absolute difference between the two descriptive means was 2.69 points, with females showing the numerically lower mean. Because no inferential comparison between male and female participants was available, these values represent descriptive patterns only and do not establish a statistically significant sex-related difference in CP-QOL.

Table 3. Overall CP-QOL Scores According to Sex

Sex	n (%)	CP-QOL Mean ± SD
Male	54 (52.9)	49.18 ± 16.48
Female	48 (47.1)	46.49 ± 15.30

Table 4. Reported Internal Consistency Coefficients for CP-QOL Component Groupings

CP-QOL Component Grouping	Cronbach's α
Social well-being and acceptance + participation	0.864
Physical health + communication	0.850
Feelings about functioning + pain/bother	0.188
Emotional well-being and self-esteem + access to services + family health	0.757
Overall scale	0.720

Internal consistency varied markedly across the reported CP-QOL component groupings. The combined social well-being and acceptance/participation component yielded a Cronbach's alpha of 0.864, while the physical health/communication grouping yielded $\alpha = 0.850$. Emotional well-being and self-esteem, access to services, and

family health collectively yielded $\alpha = 0.757$. In contrast, the combined feelings about functioning/pain and bother grouping demonstrated substantially lower internal consistency ($\alpha = 0.188$). The reported overall coefficient was $\alpha = 0.720$.

Taken together, the descriptive results demonstrate that quality of life was not uniform across the measured domains. Feelings about functioning represented the lowest-scoring domain, while family health, social well-being and acceptance, access to services, and physical health demonstrated comparatively higher mean values. The overall mean score reflected a midpoint-level aggregate of these heterogeneous domain experiences rather than uniform performance across all dimensions.

DISCUSSION

The present study assessed caregiver-reported quality of life among 102 children with cerebral palsy aged 4–12 years attending PSRD in Lahore. The principal finding was substantial variation across CP-QOL domains rather than uniformly low or high scores across all aspects of children's lives. The overall mean CP-QOL score was 47.92 ± 19.98, with the lowest mean observed for feelings about functioning and comparatively lower values for participation, while family health and social well-being and acceptance showed the highest domain means. This multidimensional pattern is consistent with the broader conceptual understanding that cerebral palsy affects not only motor performance but also participation, communication, pain, psychosocial experiences, family interactions, and access to services (1,3,4).

The comparatively low score for feelings about functioning is clinically important because functional limitations constitute a central manifestation of cerebral palsy and can influence independence, mobility, communication, play, schooling, and engagement with peers. Although the neurological lesion underlying CP is non-progressive, functional challenges may change as children grow and encounter increasingly complex physical and social demands (1). Keawutan and colleagues similarly found that ambulatory status was associated with parent-reported QOL in domains concerning feelings about functioning, with ambulant children demonstrating more favorable ratings than non-ambulant children (10). Finnish evidence also demonstrated inverse relationships between functional classification severity and QOL, supporting the broader observation that limitations in functional capacity may be reflected in caregiver perceptions of children's daily well-being (11). The current findings therefore reinforce the value of assessing functional experience as part of rehabilitation outcome evaluation rather than relying exclusively on impairment or diagnostic classification.

Participation was another comparatively lower-scoring domain in the present sample. Participation represents a child's actual involvement in home, educational, recreational, community, and social activities and cannot be inferred solely from motor capacity. Javed and colleagues documented limited participation among Pakistani adolescents with CP, with restrictions extending across several life areas and particularly low participation in work-related and future-planning domains (9). International evidence has likewise emphasized that participation is shaped not only by motor function but also by environmental accessibility, family support, opportunities for engagement, communication capacity, and availability of services (5,10). A child may therefore possess a given level of physical capacity while remaining restricted in real-world participation because of barriers outside the child's impairment itself. This distinction has important implications for rehabilitation because meaningful outcomes should include engagement in age-appropriate activities and social roles in addition to changes in body structure or motor performance.

Physical health had a mean score of 50.66 ± 15.93, while pain and impact of disability averaged 48.86 ± 20.60. These findings are compatible with previous evidence showing that physical health is an important area of concern among children with CP. The systematic review by Power and colleagues identified physical well-being as one of the poorest HRQOL dimensions among children and adolescents with CP living in low- and middle-income countries, particularly among those with greater motor impairment (5). Pakistani research by Sameet and Razaq similarly identified physical activities and health as relatively weak dimensions of caregiver-reported health-related quality of life (6). Pain also deserves specific attention because it may arise from muscle overactivity, contractures, postural asymmetry, musculoskeletal deformity, reduced mobility, therapeutic procedures, or other associated conditions. Finnish CP QOL-Child research found that pain adversely affected QOL and emphasized the importance of routinely addressing pain during clinical follow-up (11). The present results therefore support inclusion of pain and physical-health assessment within comprehensive rehabilitation planning.

The social well-being and acceptance domain showed a mean of 52.41 ± 18.65, while emotional well-being and self-esteem averaged 47.52 ± 17.58. These values demonstrate that psychosocial experience should not be assumed to parallel the degree of physical disability. Earlier work has shown that children with CP can report satisfactory emotional or social well-being despite substantial activity limitations, and discrepancies can occur between children's own perceptions and parental proxy ratings (3,4). This phenomenon may reflect adaptation, development of identity, supportive peer and family relationships, expectations, environmental accommodation, and the distinction between objective functional limitation and subjective well-being. Consequently, rehabilitation strategies focused solely on normalization of motor performance may overlook meaningful determinants of children's social and emotional experiences.

Family health had the highest mean score in the present analysis at 55.49 ± 18.78. This comparatively favorable score should nevertheless be interpreted in the context of the substantial responsibilities experienced by families caring for children with CP. Caregivers often coordinate medical appointments, rehabilitation, schooling, transportation, activities of daily living, communication needs, and social participation, and prolonged caregiving can influence physical, psychological, social, and financial well-being (15). Family support can simultaneously function as a major protective resource for the child. The quality of family relationships, caregiver coping, socioeconomic resources, and availability of external assistance can affect opportunities for participation and rehabilitation and can influence proxy perceptions of the child's QOL (3,15,16). Family-centered rehabilitation therefore remains important even when the family-health domain itself appears comparatively stronger than several child-centered functional domains.

Access to services had a mean score of 50.71 ± 16.37. In a rehabilitation population, this domain is particularly relevant because children with CP may require long-term multidisciplinary input that can include physiotherapy, occupational therapy, speech and language services, orthopedic or neurological management, assistive devices, educational support, and community-based services depending on individual needs. The influence of service access may be especially important in lower-resource environments, where geographic, financial, educational, and institutional barriers can limit continuity of care. The systematic review of QOL in low- and middle-income countries emphasized the importance of examining environmental and contextual determinants alongside clinical disability (5), while Pakistani research examining socioeconomic factors has reinforced the need to consider the resource environment in which children and families manage CP (8). The present access-to-services findings therefore add a service-related dimension to the broader pattern of QOL observed in this Lahore rehabilitation population.

The mean communication score of 47.64 ± 24.38 showed particularly wide variability, with observed scores ranging from 0 to 87.50. Communication is central to social participation, educational engagement, expression of needs, emotional interaction, and autonomy. Children with CP represent a heterogeneous population in whom communication abilities can vary substantially depending on motor speech involvement, cognition, language development, hearing, associated neurological impairments, and availability of augmentative or alternative communication support. Disease-specific QOL assessment is useful in this context because it permits communication-related experience to be considered alongside physical and psychosocial domains rather than being subsumed within a single global score (12,13). The substantial variability observed in the present study suggests that communication-related QOL needs are unlikely to be uniform across children and should therefore be considered individually during rehabilitation assessment.

The overall CP-QOL score was somewhat higher among males than females in descriptive terms, with means of 49.18 ± 16.48 and 46.49 ± 15.30, respectively. The difference was small relative to the variability within both groups and was not accompanied by an inferential statistical test; consequently, the present data do not support a conclusion that sex was significantly associated with quality of life. This restrained interpretation is particularly important because prior studies have not produced a universally consistent sex-related pattern. Hanif and colleagues reported poorer QOL among female children in their Pakistani sample (7), whereas broader CP research indicates that QOL is influenced by multiple interacting clinical, psychosocial, family, and environmental variables rather than sex alone (3,5,16). The descriptive difference observed in the present study should therefore be regarded as a sample characteristic rather than evidence of an independent sex effect.

The age distribution was concentrated in the 7–9-year group, which represented 53.9% of the study population, followed by the 10–12-year group at 37.3%. Only 8.8% of participants were aged 4–6 years. Because age-specific

QOL means and inferential comparisons were not available, the study does not establish whether quality of life differed significantly across these age categories. This is an important correction to interpretations that attribute poorer QOL directly to increasing age without corresponding statistical evidence. Age may plausibly interact with increasing educational, mobility, social, and self-care demands during childhood, but such relationships require direct analysis rather than inference from the age distribution alone. Studies using the CP QOL-Child in different age groups have demonstrated that functional status, participation, pain, and contextual factors may contribute to variation in QOL across childhood (10,11,14), supporting the need for future age-stratified analyses using adequately powered samples.

Internal-consistency findings require similarly careful interpretation. The overall Cronbach's alpha of 0.720 indicates acceptable internal consistency for the reported overall scale score, while coefficients of 0.864, 0.850, and 0.757 for several component groupings suggest stronger consistency in those groupings. In contrast, the coefficient of 0.188 for the combined feelings about functioning and pain/bother grouping indicates poor internal consistency and precludes describing that component as reliably homogeneous on the basis of the present analysis. Cronbach's alpha evaluates the interrelatedness of items within a scale or component; it does not by itself demonstrate construct validity. This distinction is important because independent validation studies of the CP QOL-Child have evaluated construct structure using methods specifically designed for validity assessment, including confirmatory factor analysis (12). Disease-specific QOL measurement has broader empirical support in CP populations (13,14), but the present reliability findings should be interpreted on their own terms and should not be used as proof that every domain or component demonstrated adequate validity in this sample.

The descriptive domain pattern observed in Lahore is broadly comparable with regional and international research indicating that physical functioning, participation, and disability-related experiences are prominent determinants of quality of life among children with CP. Das and colleagues, using the CP QOL-Child in India, demonstrated the applicability of the instrument in a South Asian pediatric CP population and reported meaningful variation across QOL domains (14). Hanif and colleagues likewise reported reduced QOL among Pakistani children with CP and identified differences according to clinical characteristics (7). Sameet and Razaq emphasized physical activity and health as important areas of concern in Pakistani children (6), while the systematic review by Power and colleagues demonstrated that physical dimensions commonly represent major QOL challenges in low- and middle-income countries (5). The convergence of these observations supports a multidimensional rehabilitation model in which functional capacity, participation, physical health, pain, communication, psychosocial well-being, family context, and access to services are assessed together.

At the same time, differences across studies should be expected because quality of life is influenced by the characteristics of the children assessed, severity and distribution of motor impairment, associated conditions, age, cultural expectations, educational access, caregiver perceptions, rehabilitation availability, and the specific instruments used. Socioeconomic status, for example, may not demonstrate a straightforward direct association with a global QOL score even when it affects particular aspects of disability, service access, or family burden (8). Caregiver proxy scores may also differ from children's self-reported experiences, especially in subjective emotional and social domains (3,11). These sources of heterogeneity make local QOL measurement particularly valuable while also limiting simple direct comparisons of mean scores between studies.

Several clinical implications arise from the present findings. First, feelings about functioning and participation deserve particular attention during assessment because they represented the lowest mean domains in this sample. Second, the wide dispersion of scores in communication, participation, and feelings about functioning indicates that children with the same diagnosis can have substantially different lived experiences and rehabilitation priorities. Third, physical health and pain remain important despite not being the lowest-scoring domains because they can directly influence mobility, participation, sleep, behavior, therapy tolerance, and caregiver burden (5,6,11). Finally, relatively higher scores in family health or social well-being should not be interpreted as evidence that these dimensions are unimportant; rather, they may represent potential areas of resilience that can be incorporated into family-centered rehabilitation planning (3,15).

The study has several strengths. It used a CP-specific QOL instrument rather than relying only on generic health or impairment measures, included multiple physical and psychosocial domains, and generated local data from a Pakistani rehabilitation population. Reporting individual domain scores provides more clinically interpretable

information than an overall score alone because it demonstrates the heterogeneity of children's experiences. The study also included both male and female participants across the 4–12-year age range and used caregiver proxy assessment suited to younger children and those who may have difficulty completing self-report instruments independently (12–14).

The findings should nevertheless be interpreted within the limitations of the study design and available analysis. The cross-sectional design captures QOL at one period and cannot establish temporal or causal relationships. Purposive sampling at a single rehabilitation institution limits generalizability to all children with CP in Lahore or Pakistan, particularly those who do not access organized rehabilitation services. Caregiver proxy reporting may differ from the child's own perceptions, particularly for subjective emotional and social experiences (3,11). The relatively small number of children aged 4–6 years creates an imbalanced age distribution, and the absence of inferential age-group comparisons prevents conclusions regarding age-related differences. Similarly, sex-specific means were descriptive and do not establish a statistically significant difference. The poor internal consistency observed for one component grouping also indicates that reliability was not uniform across all measured components, warranting caution when interpreting those scores.

Future studies would benefit from larger multicenter samples representing rehabilitation centers, hospitals, schools, community settings, and children who have limited access to formal services. Analyses stratified by age, gross motor function, CP subtype, communication status, schooling, pain, rehabilitation exposure, and socioeconomic characteristics could clarify which factors are independently associated with specific QOL domains. Where developmentally appropriate, parallel caregiver and child self-report measurement would also help quantify agreement and disagreement between perspectives. Longitudinal research could further determine whether changes in function, participation, pain, educational access, or rehabilitation engagement correspond to changes in QOL over time. Such approaches would extend the descriptive evidence generated by the present study and support more individualized, context-responsive rehabilitation planning (3,5,12).

CONCLUSION

Caregiver-reported quality of life among children with cerebral palsy aged 4–12 years varied substantially across CP-QOL domains. The lowest mean score was observed for feelings about functioning, with participation also comparatively lower, whereas family health and social well-being and acceptance demonstrated the highest mean scores. The overall CP-QOL score was 47.92 ± 19.98. Male participants had a numerically higher overall score than females, but the available descriptive analysis does not establish a statistically significant sex-related difference, and age-related differences cannot be inferred without age-stratified QOL analyses. Overall internal consistency was acceptable, although reliability varied across component groupings and was poor for the combined feelings about functioning and pain/bother component. These findings support multidimensional assessment of children with cerebral palsy that considers functional experience, participation, physical health, pain, communication, psychosocial well-being, family context, and access to services alongside conventional clinical measures.

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