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THE EFFECT OF PHYSIOTHERAPY INTERVENTIONS ON NEUROREHABILITATION OUTCOMES AND QUALITY OF LIFE AMONG RESIDENTS OF MONTSERRADO COUNTY, LIBERIA

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ABSTRACT

Background: Neurological conditions including stroke, traumatic brain injury, and spinal cord injury present a substantial burden in Liberia where physiotherapy services are undertapped. Neurorehabilitation by physiotherapy has been shown to improve functional ability and quality of life, but evidence from low-income settings is limited. This study assessed physiotherapy interventions and their relationship to neurorehabilitation outcomes and quality of life for individuals living in Montserrado County, Liberia. **Methods:** A cross-sectional survey of 672 individuals diagnosed with neurological impairments and receiving physiotherapy care was conducted. Data were obtained through a structured Likert-scaled questionnaire, which included questions on access/use of the services, appropriateness of the interventions, adherence/self-management, functional recovery, quality of life, satisfaction, barriers and safety. Descriptive statistics, chi-square test, and multivariate regression analyses were used to investigate associations between physiotherapy interventions and rehabilitation outcomes. **Results:** Of the 672 respondents 54.5% were female, 45.5% male, and most were aged 35–54. The most commonly reported conditions were stroke (42%) and traumatic brain injury (27%). The reported level of access to physiotherapy was moderate – 61% of respondents attended 3 or more sessions in the past month. Respondents performed fairly well at sticking to a home exercise program (68% of respondents), and 72% indicated that their mobility and/or self-care was improved. Quality of life scores were significantly improved for people that accessed physiotherapy regularly ($p<0.01$). Key barriers identified were financial cost (46%) and transportation (38%). Regarding the therapeutic alliance respondents reported 81% with confidence in their physiotherapists. Conclusion: Our findings indicate physiotherapy interventions had an overall positive impact on functional recovery, participation, and quality of life for residents with neurological conditions within Montserrado County. However, an ongoing access barriers including affordability and transport will need to be addressed if we are to improve service delivery and long-term community-based rehabilitation.

KEYWORDS: Physiotherapy, Neurorehabilitation, Quality of life, Neurological conditions, Liberia, Likert survey.

INTRODUCTION

Neurological conditions like stroke, traumatic brain injury (TBI), spinal cord injury (SCI), and cerebral palsy rank among the major causes of long-term disability across the globe and account significantly for morbidity, functional impairment, and impaired quality of life.[1,2] International estimates demonstrate that neurological disorders contribute to over 40% of disability-adjusted life years (DALYs), and low- and middle-income countries (LMICs) have an unfair proportion of this burden because of their less robust health systems, compromised infrastructure, and poor availability of rehabilitation services.[3] The economic impact of these conditions goes beyond the cost of direct healthcare, but influences household income, productivity, and social engagement, also fuelling poverty cycles in vulnerable groups.[4,5]

In Liberia, the historical effects of long-standing conflict and disinvestment in the health sector have resulted in

deep gaps in the delivery of specialist rehabilitation services.[6] Government hospitals and community clinics are typically under-equipped, and physiotherapy care is centralized in towns, leaving large parts of the population without access.[7] Where available, services can be disintegrated, expensive, or dependent on non-governmental organizations and international agencies.[8] Therefore, the majority of people with neurological impairments experience avoidable functional worsening, social isolation, and diminishing quality of life.

Physiotherapy is one of the cornerstones of neurorehabilitation, with evidence-based approaches to restore movement, promote independence, and enhance psychosocial well-being.[9–11] The interventions used are usually exercise therapy, mobility training, gait re-education, balance retraining, management of spasticity, and patient education for self-care.[12] In resource-rich environments, physiotherapy has proven time and again to be effective in reducing the severity of disability, improving quality of life, and promoting return to community.[13] Yet, in LMICs, such as Liberia, these interventions' implementation is faced with structural barriers of inadequate workforce capacity, affordability of care, unavailability of assistive devices, and cultural myths surrounding rehabilitation.[14,15]

In spite of these difficulties, accumulating evidence indicates that even low-intensity, community-level physiotherapy interventions can produce quantifiable gains in function and well-being.[16] However, limited empirical data are available from Liberia and other post-conflict settings, where health concerns have traditionally centered on infectious diseases and maternal-child health, with rehabilitation underserved and underfunded.[17] This lack of local data constrains the capacity of policymakers and clinicians to create evidence-based interventions specific to the Liberian situation.

This research fills this gap by investigating the effect of physiotherapy interventions on neurorehabilitation outcome, functional participation, and quality of life among Montserrado County, Liberia residents. Through a systematic Likert-scaled cross-sectional survey of 672 respondents, it investigates several facets of rehabilitation, such as access, appropriateness, adherence, outcome, satisfaction, barriers, and safety. By providing context-informed evidence, the research aims to support service delivery models and inform policy to strengthen rehabilitation in the health system of Liberia.

METHODS

Study Design and Participants

From May to July of 2025, a cross-sectional survey was conducted with adults (≥ 18 years) diagnosed with neurological conditions and receiving physiotherapy in Montserrado County. In total, 672 participants completed the questionnaire.

Instrumentation

We employed a structured Likert-scale questionnaire (developed for this study), with domains of Access & Utilization; Appropriateness of Intervention; Adherence/Self-Management; Neurorehabilitation Outcomes; Quality of Life (QoL); Satisfaction/Therapeutic Alliance; Barriers to/Facilitators of Interventions; Safety/Adverse Events. The scales used were Agreement (1 - 5); Frequency (1 - 5); Difficulty (1 - 5); and Satisfaction (1 - 5).

Data Collection and Scoring

Data were gathered face-to-face via interviews with trained enumerators. The enumerators conducted interviews in English, in cases where patients did not have adequate comprehension, translation help was provided. Data collection occur in health facilities (e.g., public hospitals, private clinics and NGO funded rehab). At the time of data collection, the enumerators had 2-day training on research ethics, completing interviews, and not influencing responses.

For scoring, reverse-coded items were modified to ensure that higher scores indicated more favorable outcomes. Subscale means were then calculated for each subscale. Where ≥70% of items from a subscale were completed, the missing item scores were imputed by using the mean score for the subscale for that individual, otherwise the subscale score was excluded from the analysis.[10] Reliability was checked by testing internal consistency reliability (Cronbach's alpha) for each subscale. An $\alpha \geq 0.70$ was considered an acceptable level of reliability.

Data Analysis

Data were imported into SPSS version 27 for cleaning and analysis. Descriptive statistics including frequencies, percentages, means, and standard deviations were used to describe the demographic and clinical characteristics and responses across the subscales. Pearson's correlation analysis was performed to assess bivariate relationships between access, adherence, functional outcomes, and quality of life. A multiple linear regression model was developed to examine independent predictors of quality of life along with the following covariates: age, gender, primary diagnosis and number of physiotherapy sessions. Statistical significance was determined at $p < 0.05$.

Ethical considerations

The Desh Bhagat University Institutional Review Board granted ethical approval (Approval Number: IRB/DBU/2024/017). All participants provided written informed consent and ensured anonymity by using unique identifiers instead of names. The participants' involvement was completely voluntary, with no incentives given to avoid coercion. Data was secured by using password-protected file servers only accessible by the research team. Community engagement was a priority and the local community leaders were engaged in program development and survey administration to

honor the local traditions and values

RESULTS

Table 1: Participant Demographics (N = 672).

Characteristic	Frequency (%)
Gender	
Female	366 (54.5%)
Male	306 (45.5%)
Age Group (years)	
18–34	180 (26.8%)
35–54	312 (46.4%)
55+	180 (26.8%)
Primary Condition	
Stroke	282 (42.0%)
TBI	181 (27.0%)
SCI	101 (15.0%)
Other (e.g., CP, neuropathy)	108 (16.0%)
Sessions last 4 weeks	
0–2	134 (20.0%)
3–4	271 (40.3%)
5–8	207 (30.8%)
>8	60 (8.9%)

The participant sample (N = 672) was approximately equal in sex (54.5% female, 45.5% male). The participants also varied a good deal with respect to age, with most participants generally equitably divided amongst the youngest adults (18-34 years), middle-aged adults (35-54 years), and older adults (55 and over). In terms of age, 46.4% identified as middle-aged, while both younger adults (18-34 years old) and older adults (55 years and older) identified respectively as a participant group of 26.8%. Most participants indicated that their primary condition was a stroke (42.0%), followed by traumatic brain injury (TBI) at 27.0%, spinal cord injury (SCI) at 15.0%, while the remaining 16.0% reported other conditions (e.g., cerebral palsy or neuropathy). In terms of engagement with the program, as defined by the number of sessions attended in the past four weeks, most participants (40.3%) attended 3-4 sessions, while attending 5-8 sessions was also fairly common (30.8%), attending 0-2 sessions (20.0%) and attending more than 8 sessions (8.9%) were rare, hence the moderate participation level overall.

Table 2: Subscale Means (± SD).

Subscale	Mean (SD)	Cronbach's α
Access & Utilization	3.45 (0.88)	0.78
Intervention Appropriateness	3.65 (0.77)	0.81
Adherence/Self-Management	3.52 (0.90)	0.75
Neurorehab Outcomes (Functions)	3.40 (0.95)	0.83
Quality of Life	3.48 (0.82)	0.79
Satisfaction/Therapeutic Alliance	3.78 (0.65)	0.85
Barriers (reverse-scored)	2.75 (0.95)	0.72
Safety/Adverse Events	3.60 (0.70)	0.80

Overall, the participant perceived scores on the subscales (dependent variables) indicated that participants' perceptions of the implementation of the intervention for the various subscales were generally positive since all mean values of those above the midpoint of the scoring scale for each subscale except for Barriers which was reverse scored. Satisfaction and therapeutic alliance scored the highest mean value (M = 3.78, SD = 0.65), showed positive experiences in their clinician–patient relations. Appropriateness of intervention (M = 3.65, SD = 0.77), as well as safety/adverse events (M = 3.60, SD = 0.70) received strong positive scores indicating that participants felt the intervention was appropriate and safe. Adherence/self-management (M = 3.52, SD = 0.90), quality of life (M = 3.48, SD = 0.82), and access/utilization (M = 3.45, SD = 0.88) received moderately favorable scores, while neurorehabilitation functional outcomes received the lowest positive score of the three non-reversed subscales. (M = 3.40, SD = 0.95). The barriers subscale, which was reverse scored to create a positive score indicated that participants had "some" barriers. Nonetheless, barriers were not experienced in a strong level (M = 2.75 (SD = 0.95). There was acceptable to good internal consistency for all subscales, Cronbach's α coefficients ranged from 0.72 to 0.85, indicating reasonable reliability for measures used.

Table 3: Barriers Reported.

Barrier	% Agree/Strongly Agree
Cost is a barrier	46%
Transport/distance is a barrier	38%
Clinic hours conflict with responsibilities	31%

The most frequently cited barrier was cost, with 46% of participants agreeing or strongly agreeing that cost was a barrier to engaging with the neurorehabilitation services. Transportation and distance were important for 38% of respondents, marking geographic accessibility as an important barrier as well. Additionally, 31% of the participants reported that clinic hours inhibited their engagement because of their personal or professional obligations, which suggests that scheduling flexibility may be relevant to increasing participation. All in all, the importance of addressing financial, logistic and time-related barriers in relation to improving access and engagement in care can be seen from our findings.

Table 4: Satisfaction and Trust in Therapist.

Item	% Agree/Strongly Agree
Overall satisfied with physiotherapy care	79%
Trust physiotherapist's knowledge/skills	83%
Therapists listened to concerns	80%
Goals aligned with patient priorities	76%
Would recommend service to others	82%

The participants reported all high levels of satisfaction in their physiotherapy care and trust in their physiotherapy care. A strong proportion (83%) reported they trusted their physiotherapist's knowledge and skills, and 82% indicated they would recommend the service to other patients. Furthermore, 80% of the participants indicated they felt their therapists listened to their concerns, and 79% were overall satisfied with the care they received. Agreement regarding the treatment goals aligning with patient priorities came in slightly lower, but still very high (76%). In conclusion, overall these results indicate a generally positive therapeutic alliance and very high perceived quality of care.

Table 5: Predictors of Quality of Life.

Predictor	β Coefficient	p-value
Access & Utilization	0.21	< 0.001
Adherence	0.18	0.002
Neurorehab Outcomes	0.35	< 0.001

A multiple regression analysis was performed to examine factors associated with Quality of Life (QoL) scores of participants. An important finding from this study was that there were three predictors of quality of life, namely Access & Utilization, Adherence, and Neurorehab Outcomes. Namely, Access & Utilization ($\beta = 0.21$, $p < 0.001$) was one of the predictors of better QoL scores indicating that the better access to healthcare services and to the effective utilization of these services improves QoL. And Adherence ($\beta = 0.18$, $p = 0.002$) indicated that greater adherence to treatment protocols enhances QoL. The strongest predictor was Neurorehab Outcomes ($\beta = 0.35$, $p < 0.001$) indicating the importance of positive neurological rehabilitation outcomes to improve overall QoL. The three predictors explained 47% of the variance in QoL scores ($R^2 = 0.47$, $F(3,668) = 186.3$, $p < 0.001$), indicating that the model fit was reasonably robust. Furthermore, the statistical significance of the model is supported by the statistically significant F-statistic ($p < 0.001$) showing that the predictors defined a model associated with QoL scores.

DISCUSSION

This work presents valuable findings about the potential value of physiotherapy in neurorehabilitation in settings with limited resources. Compared to the 672 respondents, the physiotherapy interventions conducted in Montserrado County had moderate to high levels of adherence, appropriateness, satisfaction and functional outcomes, suggesting that even though rehabilitation is still a relatively immature service delivery area in Liberia, structured rehabilitation services can result in meaningful improvements in function in low-resource settings. Based on the mean quality of life (QoL) score of 3.48/5, the findings also address other studies conducted with populations experiencing similar barriers to rehabilitation service delivery in Sub-Saharan Africa, along with other low and middle-income countries (LMICs), that examined structured physiotherapy and functional independence gains with psychosocial improvements.[11,12]

Importantly, the analysis produced stated that increased access to physiotherapy services, following adherence to physiotherapy services are parameters significantly predicted Quo outcomes. Which supports other evidence, and adds to it, that the continuity and intensity of rehabilitation; services do impact recovery pathways and the success of social reintegration.[13-15] Interventions that are designed with the needs of patients and provide the patients and physiotherapists clear communication, appear to be most effective in enhancing adherence and improving outcomes.

Despite these positive findings, many barriers were identified. Nearly half of participants identified financial cost as a key barrier. More than one-third of participants indicated transportation as a barrier. These barriers are consistent with more general literature that reports affordability, distance, and capacity of health systems as enduring barriers to rehabilitation in LMICs.[16,17] Policy level responses are needed to overcome these barriers, including subsidization of rehabilitation, decentralisation of physiotherapy services to community-based platforms, and inclusion of rehabilitation within primary healthcare systems, to support equitable access to services, and continuity of care.

One other important finding is the high levels of satisfaction and trust in therapeutic alliances. Over 80% of participants had confidence in their physiotherapist and were satisfied with care; reflecting the importance of professional capability, concern, and communication to rehabilitation outcome. This demonstrates that, even in the presence of structural barriers, therapeutic relationships can help promote patient motivation and adherence to improve functional and psychosocial outcomes.

Strengths and Limitations

A key strength of this study is the large sample size and the utilization of a wide-ranging, well validated multi-domain tool to measure and assess physiotherapy outcomes, adherence, barriers and satisfaction with physiotherapy intervention. High internal consistency of each of the subscales also reinforces the quality of the

findings. This study is one of the first large-scale studies in Liberia to systematically explore physiotherapy interventions for people with neurological conditions, and it will add context-specific evidence to the body of rehabilitation literature.

Nonetheless, a few limitations should be considered. The cross-sectional study design precludes making causal inferences; therefore, while a strong association is seen between physiotherapy and QoL, the evidence will need to be confirmed with longitudinal studies that can determine causal relationships. The study relied on self-report data which may have introduced recall bias and social desirability bias, inflating the reported adherence and satisfaction scores. Lastly, the sample of people who participated in the study were already in contact with physiotherapy; therefore the findings may not represent persons who face the greatest barriers and cannot even access rehabilitation services.

CONCLUSION

The current study indicates that the engagement of physiotherapy have significant positive impacts on recovery and rehabilitation, participation, and quality of life for clients with neurological conditions in Montserrado County, Liberia. The study adds evidence to the literature from other low-resource settings that physiotherapy is an essential component of the rehabilitation of individuals with neurological conditions, and the delivery of physiotherapy improves physical independence, psychosocial wellbeing, and engagement in social and community life.

However, barriers remain, including socioeconomic status and transportation challenges, which continue to restrict equitable access to rehabilitation services. Maximizing the positive impacts of physiotherapy, through policy change, outreach and community-based service delivery and subsidized rehabilitation services, is imperative. Enhancing capacity at the health systems level to provide rehabilitation as part of primary health care can enhance access, continuity and sustainability of care.

Future research should use longitudinal and intervention-based designs to explore causal relationships, long-term health impacts and delivery of a sustainable model of community-based rehabilitation in post-conflict and low-resourced settings. Investment by the government in affordable and accessible physiotherapy will improve the overall health of the population, decrease burden of disability, and enhance economic productivity of the entire population.

Take-Home Message

Physiotherapy greatly enhances functional recovery and quality of life for individuals with neurological conditions in Montserrado County, Liberia. However, affordability and transportation continue to be major barriers. Expanding subsidized and community-based rehabilitation services is critical to building scalable and equitable access and long-term improved outcomes.

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Conflict Of Interest

The authors attest that no conflicts of interest exist with this publication. They have no financial relationship, personal association, institutional obligation, or professional interest which might have inappropriately affected the performance, analysis, or reporting of the study. The study and findings reported rest on scientific evidence and observations from the community.

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