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FUNCTIONAL INDEPENDENCE IN ACTIVITIES OF DAILY LIVING AMONG STROKE SURVIVORS: A CROSS-SECTIONAL STUDY USING THE BARTHEL INDEX

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Abstract

Background:
Stroke is a leading cause of long-term disability worldwide. Although survival rates have improved, many stroke survivors continue to face challenges in performing activities of daily living (ADLs). In Pakistan, limited data exists on the functional dependence of stroke patients, particularly beyond the acute phase.

Objective:
To assess the level of dependence in ADLs among stroke survivors using the Barthel Index and examine its association with socio-demographic factors.

Methods:
A cross-sectional study was conducted from February to June 2024 at public hospitals in Rawalpindi and Islamabad. A total of 177 stroke survivors aged 35–65 years were selected using non-probability convenience sampling. Data on socio-demographics, stroke characteristics, and rehabilitation status were collected using a structured questionnaire. Functional ability was assessed using the Barthel Index. Statistical analysis was performed using SPSS version 20.

Results:

The majority of participants (32.8%) had moderate dependence, followed by severe dependence (26.0%). The mean Barthel Index score was 67.4 ± 28.1. Significant associations were found between level of dependence and age group (p=0.003), living status (p=0.028), type of stroke (p=0.014), duration since stroke (p=0.043), and participated in rehabilitation sessions (p=0.002). Younger participants, those with ischemic stroke, longer stroke duration, and those who received rehabilitation showed higher levels of independence.

Conclusion:

Stroke survivors exhibit a moderate level of dependence in ADLs. Age, living status, stroke type, duration since stroke, and rehabilitation significantly influence functional outcomes. Strengthening rehabilitation services and providing social support are crucial to improving post stroke independence and quality of life.

INTRODUCTION

Stroke is a sudden onset of neurological impairment resulting from acute cerebrovascular damage, either ischemic or hemorrhagic in nature. A study in 2019 reported that stroke affects approximately 12 million new individuals, with a global prevalence of 101 million, making it the third leading cause of death and disability worldwide. With advances in medical care, more people are surviving strokes, but this has also led to a growing number of individuals living with long-term physical, cognitive, and psychological complications (1). The effects of stroke can vary widely and are influenced by several factors, including the type of stroke, the site of brain damage, the individual's age, presence of comorbid conditions, and the timeliness of medical intervention (2). Activities of daily living (ADLs) encompass routine tasks that individuals carry out every day. These are typically divided into two groups: instrumental ADLs, such as managing finances or shopping, and personal ADLs, which include essential self-care tasks like eating and dressing. The most frequent outcome following stroke is dependence in ADLs , with around 35% of stroke survivors continuing to experience such limitations within the first year after the event (3).

Rehabilitation has been shown to play a vital role in reducing ADL dependence. A large cross-sectional study of acute stroke in Japan reported that an increased dose of daily rehabilitation, frequent sessions per week, and early initiation of rehabilitation were significantly associated with greater improvements in Barthel Index scores, particularly among older patients (4). The majority of motor recovery following a stroke typically takes place within the first three months, studies have also reported continued improvements in function, activity, and self-perceived outcomes beyond this initial period (5). Falls are a common complication after stroke, often leading to reduced independence, impaired mobility, and a greater risk of secondary injuries. However, a recent randomized controlled trial reported that targeted rehabilitation interventions can significantly improve balance and reduce the risk of falls in chronic stroke patients (6). According to findings from a population based study, depression frequently occurs following a stroke, with around 25% of stroke survivors exhibiting depressive symptoms, Post stroke depression is closely linked with reduced functional ability, decreased independence in daily activities, and poorer health related quality of life. These associations highlight the importance of addressing and managing depressive symptoms as a key part of stroke recovery and rehabilitation (7).

The Barthel Index is widely used tool to assess dependence in ADLs among stroke survivors. It evaluates 10 domains of personal daily functioning with scores ranging from 0 to 100, where higher scores indicate greater independence. Its validity and reliability have been confirmed in different populations, and recent studies have frequently used it both in clinical and research settings to predict long term functional outcomes. Early Barthel Index measurements (e.g. within days of stroke onset) are especially informative as they help in predicting prognosis, planning rehabilitation programs, and identifying patients who are at risk of persistent dependence (8).

Despite of growing evidence, there remains a significant gap in understanding the prevalence and predictors of ADL dependence among stroke survivors in Pakistan, especially beyond the acute recovery phase. Most studies focus on the first three months post-stroke, with little attention to the subacute and chronic stages. This study aims to assess ADL dependence in chronic stroke survivors using the Barthel Index and examine its association with socio-demographic factors.

Methods:

It was a cross-sectional study conducted from February 2024 to June 2024 at physical therapy departments in government hospitals in Rawalpindi and Islamabad. After getting approval from ethical review committee of the university DPT/1020-1206. Written informed consent was taken from each participant before collection of data. The sample size was calculated by using Rao soft, by assuming stroke patients' population 200, By considering the confidence level 95% and margin error 5%, the sample size of our study was 177. The sampling technique used was non-probability convenient sampling technique. The study included both male and female stroke patient's diagnosis confirmed by MRI or CT scan, 35-65 years of age, no communication problems. All those who had visual impairments, cognitive problems, hearing impairment or severe physical disease were excluded from study.

Data was collected using a standard questionnaire that included sociodemographic characteristics of participants. Sociodemographic factors included age, gender, marital status, living status. Questions related to stroke including type of stroke, artery affected, duration and side of stroke were asked from the participants.

The primary tool for data collection was Barthel Index. The Barthel Index is a standardized tool used to assess functional independence in performing 10 daily activities such as feeding, bathing, dressing, mobility, and toileting. It is scored from 0 to 100, with higher scores indicating greater independence; commonly, scores are categorized into total, severe, moderate, slight dependence, and independence. A recent study found the Barthel Index to have excellent internal consistency (Cronbach's alpha = 0.942) and high reliability (ICC ≥ 0.962). (9)

Data was analyzed by using SPSS 20. Descriptive statistics, frequencies and percentages mean, and standard deviation were calculated for qualitative and quantitative variables. Chi-square test was used to find out the association. The p value less than 0.05 was considered significant.

Results:

A total of 177 stroke survivors participated in the study. Among them, 101 (57.1%) were male and 76 (42.9%) were female. Most participants 88 (49.7%) were aged between 40–59 years, followed by 55 (31.0%) under the age of 40, and 34 (19.2%) aged between 60–70 years. The mean age was 55.4± 12.4 years. Most participants were married (86.4%) and living with family (76.8%), while 13.0% lived with relatives or 10.2% lived alone. The most common comorbidities were hypertension 108 (61.0%), diabetes 74 (41.8%), smoking 65 (36.7%), and heart disease 48 (27.1%).

Regarding stroke characteristics, 129 (72.9%) had ischemic stroke, while 42 (27.1%) had hemorrhagic stroke. The right side was more commonly affected 91 (51.4%) , regarding duration majority of participants stroke 35.6% had 1-3 months ago. Amongst half of the participants 89 (50.3%) mentioned that they had not received rehabilitation sessions. (Table 2)

The mean Barthel Index score was 67.4 ± 28.1. Based on the Barthel Index, most participants had moderate dependence 58 (32.8%). Details are shown in figure 1.

Statistical analysis using the Chi-square test revealed significant associations between age group ($p = 0.003$), living status ($p = 0.028$), type of stroke ($p = 0.014$), duration since stroke ($p = 0.043$), and rehabilitation status ($p = 0.002$) with the level of dependence. Younger participants and those who had received rehabilitation were more likely to be independent. A longer duration since stroke was also associated with greater independence. There was no significant association found between gender ($p = 0.214$), marital status ($p = 0.416$) and dependence level. (Table 4)

Table 2: Stroke characteristics in participants

Variable	category	Frequency	Percentage
Type of stroke	ischemic	129	72.9
	hemorrhagic	48	27.1
Side of body affected	Right	91	51.4
	Left	78	44.1
Duration since stroke	<1 month	40	22.6
	1–3 month	63	35.6
	4–6 month	46	26.0
	>6 months	28	15.8
Rehabilitation sessions done	yes	88	49.7
	no	89	50.3

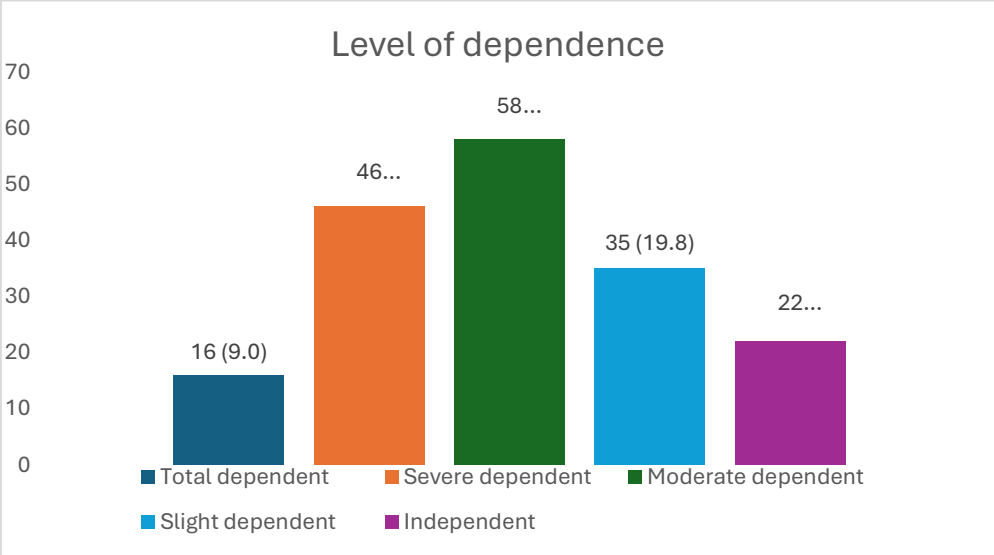

Figure 1: Barthel Index Scores among Stroke Survivors

Table 4: Association Between Socio-Demographic Factors, stroke and Level of Dependence

Variables	Category	Dependent (n=120)	Independent (n=57)	X^2	P value
Gender	Male	50 (65.8%)	26 (34.2%)	0.26	0.214
	Female	70 (69.3%)	31 (30.7%)		
Age groups	<40	30 (54.5%)	25 (45.5%)	9.28	0.003*
	40-59	61 (69.3%)	27 (30.7%)		
	60-70	29 (85.3%)	5 (14.7%)		
Marital status	Married	102 (66.7%)	51 (33.3%)	0.643	0.416
	Single/widowed	18 (75.0%)	6 (25.0%)		
Living status	With family	85 (63.0%)	50 (37.0%)	6.125	0.028*
	Relatives	20 (83.3%)	4 (16.7%)		
	Alone	15 (83.3%)	3 (16.7%)		
Type of stroke	Ischemic	79 (61.2%)	50 (38.8%)	9.32	0.014 *
	Hemorrhagic	41 (85.4%)	7 (14.6%)		
Duration since stroke	<1 month	32 (80.0%)	8 (20.0%)	12.6	0.043*
	1-3 months	42 (73.7%)	15 (26.3%)		
	4-6months	28 (60.9%)	18 (39.1%)		
	>6 months	12 (42.9%)	16 (57.1%)		

Rehabilitation done	Yes	50 (56.8%)	38 (43.2%)	9.67	0.002*
	no	70 (78.7%)	19 (21.3%)		

*p < 0.05 considered statistically significant

Discussion:

This cross-sectional study aimed to determine the level of functional dependence among stroke survivors using the Barthel Index and found a moderate level of dependency in stroke survivors, with significant associations between functional dependence and factors such as age, living status, type and duration of stroke, and rehabilitation engagement. Carmo et al in their systemic review, used Barthel Index to assess disability in stroke survivors. They found that 35% of stroke patients had moderate disability of scores 65-90 in barthel index, while 31% stroke survivors had severe disability of score less than 60. They also reported that 34% pf stroke survivors were independent (10). A descriptive study conducted in India by Bhartia et al to assess functional independence in ninety stroke patients using Barthel Index over a period of thirty days reported that 28.9% of participants were moderately dependent. The majority of cases (86.7%) in their study were ischemic strokes. Significant association was found between Barthel index and gender, type of stroke and glasco coma scale. They also concluded that functional independence improves with time after stroke and is influenced by both clinical severity and socio-demographic factors (11)

Our study results revealed that younger patients of age <40 years were more independent as compared to older patients. This aligns with literature which showed that age is major determinant of recovery in stroke survivors. A study by Yeung et al. (2020) on stroke patients reported that patients <70 years of age showed functional recovery in mobility, cognition, and daily living compared to patients of age 70 years and above. The functional improvements were most notable in the first 6 months for younger patients (12). The study supports that age as a key factor influencing long-term stroke recovery. Similarly, in a large cohort study by Knecth et al including stroke patients across different age groups found that all age groups showed similar improvements in Barthel Index scores after 4 weeks of inpatient neurorehabilitation, although in some functional items gains were modestly less in very old (13). We found that patients who suffered from ischemic stroke were more independent in performing ADLs as compared to hemorrhagic stroke patients. A study in Malaysia found that acute stroke patient of hemorrhagic type had low barthel index scores over a period of three-month discharge period. Additionally, older patients showed less improvement in Barthel Index scores, highlighting age as a limiting factor in post-stroke recovery (14).

Living with family is associated with greater functional independence. Caregiver burden and disability correlation study from Pakistan showed that Greater dependence of stroke patients is related to higher strain in caregivers (15). A Canadian study by Reeves et al. (2014) found that stroke patients living alone had significantly worse outcomes in acute care and recovery compared to those living with others. These individuals were less likely to arrive at the hospital within the critical treatment. They were also less likely to be discharged home after treatment, indicating lower functional independence. Interestingly, living alone did not significantly affect mortality or hospital readmission, but it was clearly linked to reduced access to timely care and poorer recovery (16). These findings align with our study, where participants living with family showed significantly higher levels of independence in activities of daily living. This suggests that social support and cohabitation play a key role in stroke recovery and long-term functional outcomes.

Namaganda et al conducted a case control study to explore type and risk factors of stroke among young adults. The average age of participants was around 36.8 years. They found that majority (76.5%) of patients had ischemic stroke in young adults and was more common in female. Contrary to expectations, common risk factors like hypertension, diabetes, and hyperlipidemia were not found to be significantly associated with stroke in this study (17). These findings highlight that younger stroke survivors may present with different risk profiles compared to older adults, which is essential when designing targeted prevention and rehabilitation strategies. The ischemic stroke was more prevalent, aligns with our study results where majority of patients also experienced ischemic stroke.

Limitations: The data was collected using a non-probability convenience sampling method, which may affect the generalizability of findings. Additionally, data were self-reported in some sections, which may be subject to recall bias. Longitudinal studies would be more effective in assessing the trajectory of functional recovery and the sustained impact of rehabilitation interventions.

Conclusion:
The study concluded that moderate level of dependence was in stroke survivors in Rawalpindi and Islamabad. Age, living status, type of stroke, stroke duration, and rehabilitation engagement significantly associated with functional outcomes.

Recommendations:
Longitudinal studies would be more effective in assessing the trajectory of functional recovery and the sustained impact of rehabilitation interventions. Public health initiatives must prioritize stroke rehabilitation and support systems to improve survivors' quality of life and reduce the societal burden of stroke-related disability.

Conflict of Interest:
Authors declare no conflict of Interest

Acknowledgments:
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