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Original Article

Tendency of Hemiplegic Shoulder Pain and Its Association with Activities of Daily Living Limitations in Stroke Population

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ABSTRACT

Background: A typical post-stroke consequence is shoulder pain, which discourages movement and hinders recovery. Understanding hemiplegic shoulder pain syndrome requires identifying which shoulder structures can produce pain post-stroke. Stroke patients may experience shoulder pain due to conditions like shoulder subluxation, rotator cuff impingement or rupture, adhesive capsulitis, bicipital tendonitis, among others, which contribute to activity limitations in daily living.

Objective: To assess the prevalence of hemiplegic shoulder pain and its association with activity limitations in daily living among stroke patients.

Methods: A cross-sectional survey was conducted on 377 participants after institutional ethical approval. Data were collected using a convenient sampling technique from hospitals in Haripur, Mansehra, and Abbottabad, involving patients with a stroke duration of not less than one month. Shoulder pain and disability were measured using the standardized Shoulder Pain and Disability Index (SPADI). Patients reporting shoulder pain were further evaluated using the Barthel Index to assess limitations in daily living activities. Associations between categorical variables were determined using the Chi-square test, and correlations between continuous variables were analyzed using Pearson's Correlation Test. Data were analyzed using SPSS version 25.

Results: The mean age of participants was 46.85 ± 7.30 years, with 58.1% females and 41.9% males. The majority were overweight (37.6%) and had right hemiplegic stroke (52.5%). Hemiplegic shoulder pain was reported by 54.5% of stroke patients, with 59.6% experiencing right-sided pain. A moderate to strong correlation was found between shoulder pain and activity limitations in daily living ($p < 0.001$, $r = -0.765$).

Conclusion: This study found that the majority of stroke survivors experienced post-stroke shoulder pain. There was a significant association between shoulder pain-related disability and activity limitations, indicating the need for specialized care.

Keywords: Hemiplegic shoulder pain, Barthel Index, prevalence, association, shoulder disability.

INTRODUCTION

Stroke, defined as a neurological deficit caused by an abrupt and focal injury to the central nervous system due to a vascular source, such as cerebral infarction, intracerebral hemorrhage, or subarachnoid hemorrhage, has numerous debilitating consequences (1). Among these, post-stroke shoulder pain is particularly common, significantly impacting patient mobility and recovery. This pain can arise from various shoulder structures at different times post-stroke, contributing to a condition known as hemiplegic shoulder pain syndrome (2). Stroke patients may experience shoulder pain due to several underlying conditions, including shoulder subluxation, rotator cuff impingement or rupture, adhesive capsulitis, and bicipital tendonitis, all of which contribute to limitations in daily activities (3).

Following a stroke, individuals with hemiplegic shoulder pain often experience progressively reduced shoulder motion on the affected side, a condition that typically worsens after the first month. Hemiplegic shoulder pain is more frequently and severely experienced by individuals with left-sided hemiplegia (4). Globally, shoulder pain is prevalent among stroke patients, with incidence rates ranging from 11% to 40%. This pain not only delays rehabilitation but also increases healthcare costs and exacerbates the

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burden on medical facilities (3). Various factors, including paralysis, restricted shoulder motion, spasticity, sensory abnormalities, diabetes mellitus, low Barthel Index scores indicating hindrances in daily living activities, and improper patient handling, have been associated with post-stroke shoulder pain (5).

Recent studies have highlighted the prevalence of pain in stroke victims, with a significant portion experiencing discomfort in various body regions, including the shoulder (6). Understanding the prevalence, disability, and impact of shoulder pain on daily activities in a population-based cohort of individuals who have experienced their first stroke is crucial. This study aims to provide in-depth information on these aspects, focusing on the prevalence of shoulder pain and related disabilities among stroke patients, and examining the association between hemiplegic shoulder pain and limitations in activities of daily living (ADLs) (6).

The rationale for this study is grounded in the need to increase awareness among stroke patients regarding the prevention and treatment of shoulder pain, which significantly contributes to disability. By determining the prevalence of shoulder pain and related disability, and their association with ADL limitations, this research seeks to highlight the importance of specialized care for stroke patients. Effective management of hemiplegic shoulder pain could enhance rehabilitation outcomes, reduce healthcare costs, and improve the quality of life for stroke survivors.

MATERIAL AND METHODS

A cross-sectional study was conducted at the Women Institute of Rehabilitation Sciences (WIRS), Abbottabad, from October 2023 to March 2024. Ethical approval was obtained from the Institutional Review Board of WIRS Abbottabad (Reference Id. 1881), in adherence to the principles of the Declaration of Helsinki. Participants were recruited from the rehabilitation departments of various hospitals in Haripur, Abbottabad, and Mansehra, following guided protocols and ethical considerations. All participants received a comprehensive explanation of the study's objectives and procedures before providing written informed consent (7).

The study included 377 stroke patients who had experienced a stroke involving the anterior, middle, or posterior cerebral artery (either hemorrhagic or ischemic) for more than three months post-onset. Inclusion criteria required participants to be over 40 years of age, capable of adequate communication, and possess intact cognitive function (3, 7, 8). Exclusion criteria comprised individuals unwilling to participate, those with cognitive impairments, history of shoulder surgery before stroke onset, skin problems or infections on the affected shoulder, pre-existing shoulder pain or disability due to systemic conditions such as diabetes, or structural deformities due to fractures (8).

Data collection utilized a convenient sampling technique, gathering information through standardized instruments. Shoulder pain and disability were assessed using the Shoulder Pain and Disability Index (SPADI), a self-administered questionnaire consisting of 13 items divided into pain and disability subscales. Participants rated their responses on a scale from 0 (no pain or difficulty) to 10 (maximum pain or difficulty), with scores ranging from 0% (no disability) to 100% (worst disability) (11). For those reporting shoulder pain, the Barthel Index (BI) was administered to evaluate limitations in daily living activities. The BI assesses ADLs across ten categories, with scores ranging from 0 (severe dependence) to 100 (independence) (9, 10).

Data were analyzed using SPSS version 25. Demographic data were summarized using means and standard deviations, presented in tabular form. The Chi-square test was applied to identify associations between categorical variables, while Pearson's correlation test was used to assess relationships between continuous variables. Statistical significance was set at $p<0.001$.

The sample characteristics included a mean age of 46.85 ± 7.30 years, with a higher proportion of females (58.1%) compared to males (41.9%). Most participants were classified as overweight (37.6%) and presented with right hemiplegic stroke (52.5%). Hemiplegic shoulder pain was reported by 54.5% of participants, predominantly on the right side (59.6%). The study found a significant moderate to strong correlation between shoulder pain and ADL limitations ($p<0.001$, $r=-0.765$).

In conclusion, the study provided critical insights into the prevalence of hemiplegic shoulder pain and its impact on daily living activities among stroke survivors. The findings underscore the necessity for targeted interventions to manage shoulder pain effectively, thereby improving the overall rehabilitation outcomes for stroke patients.

RESULTS

The study included 377 participants with a mean age of 46.85 ± 7.30 years. Among these, 219 (58.1%) were female, and 158 (41.9%) were male. The majority of the sample had right hemiplegic stroke (52.5%), and 37.6% were classified as overweight. Detailed demographic characteristics are shown in Table 1.

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Table 1: Sample Characteristics

Variable	Values	Mean ± SD
Age		46.85 ± 7.30
Gender	Male	158 (41.9%)
	Female	219 (58.1%)
Hemiplegic Side	Right	198 (52.5%)
	Left	179 (47.5%)
BMI	Underweight	78 (20.6%)
	Normal	109 (28.9%)
	Overweight	142 (37.6%)
	Obese	48 (12.9%)
Duration of Stroke	3 months	42 (11.1%)
	3 to 6 months	209 (55.5%)
	More than 6 months	126 (33.4%)
Work Level	Sedentary	282 (74.8%)
	Normal	55 (14.5%)
	Active	40 (10.7%)
Intensity of Work	Low Intensity	282 (74.8%)
	Moderate Intensity	55 (14.5%)
	Moderately High Intensity	40 (10.7%)

Hemiplegic shoulder pain was reported by 205 (54.5%) participants. Among these, 122 (59.6%) experienced right-sided pain, while 83 (40.4%) had left-sided pain. Detailed frequency of hemiplegic shoulder pain is presented in Table 2.

Table 2: Frequency of Hemiplegic Shoulder Pain

Variable	Frequency (%)
Shoulder Pain	205 (54.5%)
- Left Sided	83 (40.4%)
- Right Sided	122 (59.6%)
No Pain	172 (45.5%)

Descriptive statistics for SPADI and Barthel Index (BI) scores are provided in Table 3. The mean BI score was 65.78 ± 23.90, indicating varying degrees of dependence in ADLs. SPADI scores averaged 24.12 ± 8.11 for pain and 41.33 ± 20.24 for disability, with a total mean score of 55.46 ± 27.31.

Table 3: Descriptive Statistics of SPADI and Barthel Index

Variable	Frequency (%)	Mean ± SD
Barthel Index		
- Independent	47 (22.9%)	
- Slight Dependence	118 (57.5%)	
- Complete Dependence	40 (19.5%)	
- Mean Score		65.78 ± 23.90
SPADI		
- Pain Score		24.12 ± 8.11
- Disability Score		41.33 ± 20.24
- Total Mean Score		55.46 ± 27.31

Correlation analysis showed a significant negative relationship between shoulder pain and BI scores, indicating that greater shoulder pain was associated with greater limitations in ADLs. The correlation coefficients are detailed in Table 4.

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Table 4: Correlation Between SPADI Scores and Barthel Index

Variable	Mean ± SD	Pearson Correlation (r)	P Value
SPADI (Pain)	24.12 ± 8.11	-0.817	<0.001
Barthel Index	65.78 ± 23.90		
SPADI (Disability)	41.33 ± 20.24	-0.842	<0.001
Barthel Index	65.78 ± 23.90		
SPADI (Total)	55.46 ± 27.31	-0.867	<0.001
Barthel Index	65.78 ± 23.90		

Finally, the Chi-square test demonstrated a significant association between the side of shoulder pain and functional limitations in ADLs, as shown in Table 5.

Table 5: Association Between Hemiplegic Shoulder Pain and Barthel Index

Shoulder Pain	Total	Barthel Index (Independent)	Barthel Index (Slight Dependent)	Barthel Index (Severe Dependent)	P Value	df
Left Shoulder Pain	83	20	50	13	<0.001	4
Right Shoulder Pain	122	27	68	27		
Total	205	47	118	40		
Pearson's R					-0.765	

These results highlight a significant prevalence of hemiplegic shoulder pain among stroke survivors, with a strong association between shoulder pain and disability, and limitations in ADLs. This underscores the need for targeted interventions to manage hemiplegic shoulder pain effectively to improve the overall rehabilitation outcomes for stroke patients.

DISCUSSION

The findings of this study revealed a significant prevalence of hemiplegic shoulder pain among stroke survivors, with 54.5% of participants reporting pain. This prevalence aligns closely with the study by Li et al., which reported hemiplegic shoulder pain in 55.6% of stroke patients at admission, 59.4% after two months, and 55.1% after four months (12). The higher prevalence in females observed in this study, with 58.1% of the affected population being female, is consistent with Li et al.'s findings, which also noted a greater incidence of shoulder pain in women (13). This gender disparity might be attributable to differences in muscle strength, hormonal influences, and pain perception between males and females.

The study by Aras et al. found a similar prevalence rate, with 63.5% of stroke patients reporting shoulder pain (13). However, Rahmatian et al. reported a lower prevalence of 23% in their systematic review and meta-analysis of Iranian stroke patients (14). This discrepancy might be due to variations in study populations, healthcare settings, and methodologies. Additionally, Ali et al. found a prevalence of 29.56% overall, with 14.06% in the acute stage and 31.90% in the chronic stage post-stroke, suggesting that the timing of assessment post-stroke significantly affects prevalence rates (15).

The strong negative correlation between shoulder pain and limitations in activities of daily living (ADLs) observed in this study is in line with previous research. Lindgren et al. found that shoulder pain significantly restricted patients' daily lives post-stroke (16-17). Similarly, Meyer et al. reported a moderate association between shoulder disability and activity limitations six months post-stroke (19). The findings of this study, which showed correlation coefficients of -0.817 for pain, -0.842 for disability, and -0.867 for the total SPADI score with the Barthel Index, underscore the profound impact of shoulder pain on functional independence in stroke survivors (19).

This study had several strengths, including a relatively large sample size and the use of standardized and validated assessment tools, such as the SPADI and Barthel Index. The multi-center approach, involving hospitals in Haripur, Abbottabad, and Mansehra, enhanced the generalizability of the findings to a broader stroke population. However, there were also limitations. The cross-sectional design precluded the establishment of causality between hemiplegic shoulder pain and ADL limitations. The reliance on self-reported measures for assessing pain and disability may have introduced response bias. Furthermore, the study did not account for potential confounders such as pre-existing conditions, medication use, and variations in rehabilitation interventions, which could have influenced the outcomes (18).

Future research should consider longitudinal designs to establish causal relationships and explore the temporal dynamics of hemiplegic shoulder pain and its impact on ADLs. Additionally, studies should incorporate objective measures of shoulder function and pain, as well as detailed assessments of rehabilitation protocols to identify best practices for managing shoulder pain in stroke survivors. Tailored interventions that address both pain and functional limitations are recommended to enhance rehabilitation outcomes and quality of life in this population.

CONCLUSION

In conclusion, this study highlighted a significant prevalence of hemiplegic shoulder pain among stroke survivors, with a substantial impact on daily living activities. The findings underscore the need for comprehensive and individualized management strategies to address shoulder pain and associated disabilities in stroke rehabilitation programs.

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