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ORIGINAL ARTICLE

Integrating Pain Assessment and Personalized Goals: A Preliminary Study on Rehabilitation Outcomes for Post-Stroke Hemiplegic Shoulder Pain

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ABSTRACT

Introduction: Hemiplegic shoulder pain (HSP) is a frequent complication in stroke survivors, negatively impacting rehabilitation and overall quality of life. HSP can make it hard to do everyday things, which can make patient anxious, stressed, and depressed because of muscle pain, spasticity, and less ability to do things. This study aims to clarify the correlation between shoulder pain intensity and clinical variables, also to evaluate the efficacy of Goal Attainment Scaling (GAS) in facilitating patients' achievement of rehabilitation goals following intervention.

Methods: This cross-sectional study collected data from post-stroke patients with HSP at the Neurorehabilitation Department of Hasan Sadikin Hospital over a one-year period. The demographics of the patients (age, sex), clinical measure such as Range of Motion (ROM), Motor Assessment Scale (MAS), Brunnstrom stage, Manual Muscle Test (MMT), Depression Anxiety Stress Scales (DASS), Scale of Pain Intensity (SPIN), and Goal Attainment Scaling (GAS), were carefully recorded.

Results: Pain during movement was considerably greater than pain at rest (3.3±0.9 vs 3.0±1.3; $p<0.05$). GAS analysis indicated improvements following to the rehabilitation program (37.2±0.44 vs 52.6±0.4; $p<0.05$). A significant correlation was identified only in DASS Depression scores ($r=0.55$; $p<0.05$), when other variables shown no significant correlation.

Conclusions: HSP demonstrate greater intensity during movement and a moderate correlation with depression; a significant enhancement in GAS scores following intervention confirms the crucial role of goal-oriented rehabilitation in improving functional outcomes for post-stroke HSP patients. It is recommended to continue future research with larger sample sizes to strengthen the statistical correlations among clinical variables.
Keywords : GAS, Hemiplegic, Shoulder, Stroke, Pain

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INTRODUCTION

Hemiplegic shoulder pain (HSP) is a frequent and disabling complication in post stroke patient, with prevalence rates ranging from 16% to 84% depending on the population and assessment methods used.[1] HSP give negative impacts patients participation in rehabilitation programs and quality of life, often resulting in increased anxiety, depression, and reduced physical function. Previous systematic reviews also shows that psychosocial factors such as depression and anxiety can significantly worsen pain perception and delay functional recovery.[2,3] The aetiology of HSP is multifactorial, including spasticity, soft tissue injury, rotator cuff pathology, and central post-stroke pain mechanisms.[4] Managing HSP effectively is important to optimize functional recovery and help patient to independence in daily task. Despite various treatment modalities, the assessment of pain intensity and rehabilitation outcomes being challenging.[5]

Pain assessment tools such as the Numeric Rating Scale (NRS) are widely used to quantify pain severity, but they may not fully capture the impact of pain on function. As an alternative, the Shoulder Pain Index (SPIN) has been developed specifically to assess both the intensity and the functional consequences of hemiplegic shoulder pain (HSP). Although NRS is widely used, SPIN was chosen because it captures both pain intensity and functional impact, and is feasible in patients with post-stroke cognitive or language deficits making it more suitable for evaluating pain in this population.[6,7] Goal Attainment Scaling (GAS) has emerged as a valuable patient-cantered outcome measure in rehabilitation, enabling individualized goal setting and evaluation of progress. Current study confirm that GAS is sensitive in capturing functional gains in stroke rehabilitation during both subacute and chronic phases. However, studies focusing on the relationship between pain intensity using SPIN, psychological factors, and functional goal attainment in post-stroke HSP populations are limited, particularly in the Indonesian clinical setting.[8,9]

This study aims to clarify the relationship between shoulder pain intensity and relevant clinical variables, and to assess the effectiveness of Goal Attainment Scaling (GAS) in supporting rehabilitation goal achievement in post-stroke patients with HSP.

METHODS

Design

This cross-sectional study was conducted in the Neurorehabilitation Department, Hasan Sadikin General Hospital, Bandung, Indonesia, over a one-year period between June 2024 until June 2025. The study protocol was approved by the Institutional Ethical Committee (Reference Number: DP.04.03/D.XIV.6.5/522/2025)

Subjects

Thirteen post-stroke patients diagnosed with hemiplegic shoulder pain who underwent a structured rehabilitation program consisting of shoulder ROM exercises (active-assisted and active), postural control training, spasticity management, and individualized functional task practice. Each session lasted 45–60 minutes, 2–3 times per week for 8 weeks, were enrolled consecutively according to inclusion and exclusion criteria.

Inclusion criteria were adult age (>18 years), history of stroke (ischemic or haemorrhagic) that has been clinically or radiologically diagnosed, presence of hemiplegic shoulder pain on the hemiplegic side, medically stable, able to communicate verbally or non-verbally and a willing to participate. Patients with pre-existing shoulder pathology, severe cognitive impairment, in state of a medical instability or other neurological conditions were excluded.

Study Protocol and Data Collection

Demographic data collected in this study included participants age, sex, type and location of stroke, side of hemiparesis, and duration of stroke. A comprehensive clinical assessments were conducted to provide a specific evaluation of each participant's condition. The assessment are measure some clinical variable like the range of motion (ROM) of the affected shoulder—specifically flexion, abduction, internal rotation, and external rotation—recorded in degrees. Additional assessments included the Motor Assessment Scale (MAS), Brunnstrom stage, and Manual Muscle Testing (MMT) to evaluate motor function. The Functional Independence Measure (FIM) was used to assess the level of independence in daily activities, while the Depression Anxiety Stress Scales (DASS) used to measured psychological well-being. Pain intensity was evaluated using the Shoulder Pain Index (SPIN) at two condition in rest, and during movement. The last Goal Attainment Scaling (GAS) was used at start and end of the rehabilitation program to evaluate progress each individual achieved treatment goals.

Data analysis

Descriptive statistics were used for demographic and clinical characteristics. To determine significantly pre- and post-rehabilitation GAS scores Paired t-tests were used. Pearson and Spearman correlation coefficients were calculated to search corellation between pain, psychological, and functional variables. Statistical significance was set at $p<0.05$. All analyses were performed using SPSS version 25.

RESULTS

The characteristics of the study subjects are presented in Table 1. The mean age of the participants was 57.2 ± 8.2 years, with the majority is male (77%). The median duration of stroke onset was 9 months. The majority of subject had suffered an infarct-type stroke (92%), while 8% had a haemorrhagic stroke. Lesion location was distributed as follows: 8% cortical, 46% subcortical, and 46% damage both cortical and subcortical area. The percentage of patients with right and left hemiplegia was largely equal (46% and 54%, respectively).

As presented in Table 2, the Wilcoxon test demonstrated a statistically significant difference in pain scores between movement and rest ($Z = -2.636$, $p = 0.008$), indicating that pain was significantly higher during movement compared to rest.

Table 3 shows the correlation coefficients and significance values between shoulder pain intensity during movement compare at rest with various clinical variables. The results indicate that pain during movement had a moderate and statistically significant correlation with DASS Depression ($r = 0.559$, $p = 0.047$). However, correlations between pain and other clinical variables, such as range of motion (ROM), muscle strength (MMT), muscle spasticity (MAS), Brunnstrom Stage, DASS anxiety, DASS stress, and functional independence (FIM), were generally weak or very weak and not statistically significant. These findings suggest that psychological status plays a more role than physical impairment in influencing perceived shoulder pain in this study.

Furthermore, Table 4 presents the results of the paired t-test assessing changes in GAS scores from baseline to outcome after rehabilitation program. A significant improvement was showed, with a mean difference of -15.4000 ± 6.4565 ($t = -8.6000$, $p = 0.00002$), that indicate as statistical there are significant change in GAS scores following the intervention.

Table 1. Subject Characteristic

Variable	Total (n = 13)
Age (years), (mean±SD)	57.2 ± 8.2
Sex, n (%)	
Male	10 (77%)
Female	3 (23%)
Duration of stroke (months), median (IQR)	9
Stroke type, n (%)	
Infarct	12 (92%)
Haemorrhagic	1 (8%)
Lesion location, n (%)	
Cortical	1 (8%)
Subcortical	6 (46%)
Cortical and Subcortical	6 (46%)
Hemiplegic side, n (%)	
Right	6 (46%)
Left	7 (54%)

Table 2. Test Results for Changes in Shoulder Pain Intensity between Movement and Rest

Variable	Z-Score	P-Value	Interpretation
SPIN at move – SPIN at rest	-2.636	0.008	Statistically significant

Table 3. Correlation Coefficients and Significance Values between SPIN (Movement and at Rest) and Clinical Variables

Variable	Correlations Coefficient	Correlation	$p-value$
SPIN Movement			
ROM Flexi	0,292	Weak	0,333
ROM Abduction	0,125	Very Weak	0,685
ROM Internal	0,236	Weak	0,437
ROM External	0,164	Very Weak	0,592
MMT Flexor	0,272	Weak	0,369
MMT Abductor	0,083	Very Weak	0,787
MMT Extensor	0,171	Very Weak	0,577
MAS	0,041	Very Weak	0,893
Brunstrom Stage	0,333	Weak	0,265
DASS Depression	0,559	Moderate	0,047
DASS Anxiety	0,177	Very Weak	0,562
DASS Stress	0,126	Very Weak	0,681
FIM Total	0,107	Very Weak	0,728
SPIN at Rest			
ROM Flexi	0,047	Very Weak	0,879
ROM Abduction	0,133	Very Weak	0,665
ROM Internal	0,057	Very Weak	0,854
ROM External	0,291	Weak	0,334
MMT Flexor	0,062	Very Weak	0,841
MMT Abductor	0,278	Weak	0,358
MMT Extensor	0,305	Weak	0,311
MAS	0,021	Very Weak	0,945
Brunstrom Stage	0,373	Weak	0,210
DASS Depression	0,524	Moderate	0,066
DASS Anxiety	0,071	Very Weak	0,817
DASS Stress	0,001	Very Weak	0,996
FIM Total	0,016	Very Weak	0,959

Table 4. Test Result for Changes in GAS Scores from Baseline to Outcome

Variable	Mean	Std Deviasion	t-value	p-value	Interpretation
GAS Baseline – GAS Outcome	-15.4000	6.4565	-8.6000	0.00002	Statistically significant

DISCUSSION

This preliminary study investigation the integration of pain assessment and personalized goal-setting in the rehabilitation of post-stroke hemiplegic shoulder pain (HSP) patients. The demographic profile of our participants, first mean age of participants was 57.2 years (SD 8.2), aligning with recent epidemiological data indicating that stroke incidence increases with age, particularly among individuals aged 50 and above. A study analysing U.S. data from 1990 to 2019 reported that the majority of stroke cases occurred in individuals over 50 years old, with a notable rise in incidence among younger adults aged 15–49 in certain regions.[10] This trend show how importance age is as a significant factor in stroke risk and recovery outcomes. Other data shows that 77% of participants were male, which is consistent with the evidence man are most likely to get stroke than women. Data from the Centres for Disease Control and Prevention (CDC) indicate that men have a higher risk of stroke compared to women, although women may have more severe outcomes. Man have higher rates of hypertension and smoking, that may explained the difference between this gender. The median duration for stroke onset was 9 months, which means most participants in this study are on the subacute to chronic phase of recovery. This period is important, as hemiplegic shoulder pain (HSP) often start or getting worse during these stages, potentially slowly rehabilitation progress. Early and continuous pain assessment is essential to prevent chronicity and functional decline.[11]

The study mostly showed ischemic strokes (92%), with a smaller proportion having haemorrhagic strokes (8%). This distribution is align with national epidemiology, where approximately 87% of all strokes are ischemic type.[12,13]

The higher presentence of ischemic strokes in our study in line with worldwide epidemiological finding. The distribution of stroke lesions are 46% subcortical, 46% combined cortical-subcortical, and 8% cortical. Which are in consistently observed in large multicentre studies and are linked to the prevelence of atherosclerotic and cardioembolic risk factors in the general population.[14] The relationship between the location of lesion and hemiplegic shoulder pain (HSP) is still not clear. Some studies suggest that larger strokes, which affecting multiple regions, are associated with a higher prevalence of HSP, the direct correlation between specific lesion locations and shoulder pain is not well established. A recent observational study found that patients with large-area strokes were more probable to develop HSP, indicating that the extent of the lesion may be a more significant factor than its precise location. This demonstrate the multifactorial characteristic of HSP and it's important to have comprehensive assessment strategies.[15] Hemiplegia was almost equally distributed between the right (46%) and left (54%) sides in our study. The effect of hemiplegic side on the prevalence and severity of HSP are not clearly yet. Some studies have reported a increase incidence of HSP in patients with left-sided hemiparesis, possibly attribute to hemi spatial neglect and various neuropsychological factors. However, other research demonstrate there are no significant difference in HSP compared the side of hemiplegia. These findings suggest that although the side of hemiplegia may affect certain aspects of post-stroke recovery, its role in the development of HSP necessitates further study.[1,16]

Our findings demonstrated a statistically significant reduction in pain intensity scores during movement compared to rest, underscoring the exacerbating effect of movement on HSP and the importance of targeted interventions during active rehabilitation. Furthermore, a moderate correlation between depression scores (DASS) and pain intensity during movement highlights the complex interplay between psychological well-being and pain perception in this patient group. Similar findings were reported in a recent cohort study, where mood disorders were strongly linked to pain severity and lower quality of life. This underlines the need to integrate psychological screening and intervention in HSP management.[3,4]

Interestingly, physical assessment like ROM, MAS, MMT, and FIM did not show significantly correlation with pain. This may indicate the multifactorial aetiology of HSP, where pain is affected not only by musculoskeletal and neurological disorder, but also by emotional and cognitive factors.[3] Small sample size may have decrease to identify weaker associations. Larger studies that differentiate between subacute and chronic stroke populations, while stratifying according Brunnstrom stages, would clarify these interactions. Pain and recovery post stroke are also highly individualized, variation in pain thresholds, coping mechanisms, and comorbid conditions may hide clear corelation between physical assessment and subjective pain reports. Due to this complexity single clinical measures may not able to capture the factors that causing in this population study.[3,4]

A lack of significant correlation between some clinical variables and shoulder pain are in line with prior research finding. For example, Lee et al. showed no significant correlation between the stage of motor recovery and sonographic findings in patient with HSP, which suggest that motor improvement may not directly correlate with soft tissue pathology associated with shoulder pain.[17] Kalichman et al. also addressed about relationship between spasticity and shoulder pain are not clear. This study show both central and peripheral mechanisms take part in pain development regardless of spasticity levels. Similar with that, Huang et al. identified no significant correlation between sensory function and soft tissue lesions observed by ultrasound in HSP patients. These findings highlight the importance of multidimensional and holistic approach to assessment and management in post-stroke HSP.[16,17]

A Significantly improvement in Goal Attainment Scaling (GAS) from baseline to outcome further confirms the concept that personalized, patient-cantered rehabilitation program. GAS is becoming more widely accepted as a usefull outcome measure in neurorehabilitation, because this tools shows both patient and clinician priorities and facilitates them to make decision together. Our findings align with existing literature suggesting that GAS is beneficial to functional gains in neurorehabilitation and increase patient engagement.[8,9,18]

Strengths and Limitations

A major strength of this study are comprehensive approach, which includes both detailed pain assessment and personalized goal setting. This is in line with best practice in rehabilitation at this time. The main limitation is small sample size, which make it's harder to find correlation among variable. Also, the follow-up period is relatively short, so it may not show long-term effects. The cross-sectional design also prevents causal inference. Furthermore, potential confounding factors including pre-stroke psychiatric history or unassesed comorbidities were not consider for.

Recommendations and Future Directions

Future research should address these limitations by recruiting larger, more diverse cohorts and extending follow-up to explore long-term effects. In addition, future studies are encouraged to separate subacute and chronic patient groups, as well as to conduct analyses based on Brunnstrom stages (such as comparing stage 3 versus stages 4–5), to enable more precise and meaningful interpretations. Studies should also investigate the role of pharmacological or non-pharmacological interventions, which show promise in HSP management. Furthermore, research should continue to explore the interaction of psychological factors, pain, and functional recovery, aiming to develop robust, patient-tailored protocols for broad clinical application.

CONCLUSION

Future research should mitigate these limitations by recruiting larger, more varied cohorts and increasing follow-up to investigate long-term effects. Moreover, future research should differentiate between subacute and chronic patient groups and conduct analyses based in Brunnstrom stages (for example, comparing stage 3 with stages 4–5) to allow more accurate and significant interpretations. Research should also examine the efficacy of pharmacological and non-pharmacological interventions that suggest possibility in the management of HSP. Moreover, research should continue in investigating the relationship of psychological factors, pain, and functional recovery, with the objective of developing robust, individualized protocols for general clinical implementation.

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