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Hemiplegic Shoulder Pain: A Descriptive Study

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ABSTRACT

Introduction: Stroke is the number one cause of disability and the number three cause of death in the world after heart disease and cancer in both developed and developing countries. The disorder that often occurs is weakness in the upper extremities with the main complication being shoulder disorders. Hemiplegic Shoulder Pain (HSP) is one of four complications that often occurs in stroke patients. Research in several countries reports HSP rates of more than 65%. The diagnosis of HSP is difficult to make and is often used to describe a complexity of shoulder problems. Many factors influence the occurrence of HSP, such as immobilization, shoulder impingement, subluxation, spasticity and neuropathic pain. The consequences of HSP are decrease in the functional ability of upper extremity and disturbances in comfort and even sleep disorders which will reduce the quality of life. Physiotherapists play a role in preventing and providing interventions for HSP conditions. Clinical data on the incidence of HSP and the risk factors that cause it are needed to create a comprehensive HSP prevention program and intervention plan. To determine the incidence of HSP and its risk factors in post-stroke patients. **Method**: This study used descriptive method with a case study design using questionnaires and physical examination. The research subjects were chronic stroke sufferers with onset less than 1 year, totaling 78 people. The questionnaire used contains questions about history of stroke and other conditions related to stroke and shoulder pain. The physical examination and measurements used are the Shoulder Pain and Disability Index (SPADi) to assess the level of pain and disability and the Fugl Meyer Assessment for Upper Extremity (FMA-UE) for upper extremity functional ability. The research was conducted at the Mahar Mardjono National Brain Center Hospital, Jakarta from August to September 2023. **Results:** This study shows that 77% of stroke sufferers experienced HSP and there was a significant relationship between HSP and levels of pain and disability (p=0.000) as well as decreased upper extremity functional ability (p=0.050). **Conclusion:** HSP is a complication that often occurs in stroke sufferers and can affect the level of pain and disability and upper extremity functional ability.

Keywords**:** *Hemplegic Shoulder Pain, Stroke,* pain and disability, upper extremity functional ability.

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INTRODUCTION

Stroke is the number one cause of disability and the number three cause of death in the world after heart disease and cancer in both developed and developing countries. The results Riset Kesehatan Dasar Kementerian Kesehatan (Riskesdas) in 2018, the prevalence of stroke in Indonesia reached 10.90/00 or in other words 11 out of 1000 people in Indonesia will experience a stroke. The disorder that often occurs is weakness in the upper extremities with the main complication being shoulder disorders. The shoulder is a less stable and has very high mobility joint, it makes the shoulder vulnerable to post-stroke musculoskeletal complications, such as pain, subluxation and limited joint range of motion (ROM) (Palastanga et al, 2014). Hemiplegic shoulder pain (HSP) is one of the complications that occurs in post-stroke patients with an incidence rate for 16 to 40% (Anwer S, 2020).

The diagnosis of HSP is difficult to make and is often used to describe a complexity of shoulder problems. Most studies have speculated about the etiology of shoulder pain in hemiplegia but have failed to establish a cause-and-effect relationship. Some of the most frequently suspected factors contributing to

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shoulder pain include subluxation, contractures, complex regional pain syndrome (CRPS), rotator cuff injury, and spastic muscle imbalance of the glenohumeral joint (Karaahmat OZ, 2014).

HSP can have a negative impact on the rehabilitation phase and will subsequently affect the quality of life. Several causes of HSP can be grouped into 2 large groups, namely neurological (paralysis, spasticity, sensory disorders and neuropathic pain) and mechanical factors (glenohumeral subluxation, injury of the rotator cuff muscles, muscle imbalance and changes in the position of the scapula) (Vasudevan JM, 2014). Glenohumeral subluxation can complicate rehabilitation as shoulder function is necessary for successful transfers, performing activities of daily living, effective hand function and maintaining balance. Additionally, patients with an acute stroke performing rehabilitation with poor upper limb motor function are more vulnerable to soft-tissue injuries, tendonitis and pain. The most common sites of soft tissue injury are the biceps and supraspinatus tendon on the affected side (Razaq S, 2016).

Good shoulder function is a precondition for effective hand function, as well as for performing many tasks involving mobility, ambulation, and activities of daily living (ADL). One of the sequelae of stroke is hemiplegic stroke pain (HSP), which can detain functional recovery and subsequently cause disability. Coskun Benlidey reports that HSP can occur early, from 2 weeks after stroke but usually occurs within 2-3 months after a stroke. A study by Adey-Wakeling found the frequency of post-stroke HSP increased to 29% over a 12-month follow-up period, with mean pain scores being most severe at 4 months.

The incidence of HSP is closely related to a decrease in muscle strength in the upper extremities, especially the shoulder muscles. Beside decrease muscle strength, in chronic conditions there will also be a decrease in range of motion (ROM) in the shoulder. To comprehensively understand HSP, it requires data analysis of pain levels (SPADI), motor abilities (Fugl Meyr Assessment Upper Extremity), stroke trigger factors, and time of onset.

A good understanding of the multi-factorial risks and factors associated with HSP can improve the management of HSP and determine early preventive measures for HSP. There are two systematic review journals that explore HSP risk factors. The first review focused on incidence and prevalence rates, but did not include risk factors. Other journals examine (a) prospective cohort studies, (b) risk factors in the first month after stroke, and (c) pain measurements within 1 year after stroke (Holmes RJ, 2020).

METHODS

The study methods were descriptive case study with quantitative descriptive design. The samples of study were stroke sufferers with an onset of less than one year. The study was carried out at the Mahar Mardjono National Brain Center Hospital, Jakarta, starting from August to September 2023 and was willing to take part in the research program (signing informed consent). The sampling method used a purposive sampling method, 78 people were selected based on the following inclusive criteria: (a) Post-stroke patients less than one year; (b) all age groups; (c) female and male gender (d) able to communicate well; (d) willing to take part in a research program at the Mahar Mardjono Brain Central Hospital, Jakarta. The exclusion criteria were as follows: (a) patients with cognitive impairment; (b) aphasia; (c) uncooperative.

Data collection was carried out using 2 methods, demographic data and hospital chart were taken based on data from the sample's Electronic Health Record (EHR) at the Mahar Mardjono National Brain Center Hospital and the results of filling out the questionnaire. Data from the EHR includes the NIHSS value when the sample had a stroke, the type and location of the brain affected by the stroke. NIHSS is used to determine whether the severity of stroke will affect the incidence of HSP. The author's assumption is that the higher the NIHSS, the higher the incidence and severity of HSP.

Then, a shoulder pain questionnaire was filled out, especially including whether there

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was shoulder pain after a stroke (HSP), shoulder pain score when inactive and moving (VAS), history of diseases that causing the stroke, and history of shoulder pain before the stroke. This questionnaire is used to find out how many subject experience HSP and how many do not. After the subjects are divided into 2 groups, an analysis will be carried out on the factors that influence HSP in each group. Based on the survey, the sample was divided into 2 groups, namely Group With HSP and Group Without HSP. Data from the questionnaire includes age, gender, history of comorbidities (diabetes mellitus and hypertension), and history of previous shoulder pain.

The measurements were taken to determine the level of pain and disability using the Shoulder Pain and Disability Index (SPADi) and the functional ability of the arm using the Fugl Meyer Assessment for Upper Extremity. The independent variable from this study is hemiplegic shoulder pain and the dependent variable includes the level of pain and disability as well as the functional ability of upper extremity.

This research has previously undergone ethical testing by the Research Ethics Committee in National Brain Centre Hospital Jakarta, according to The Statement Letter number DP.04.03/D.XXIII.9/126/2023 on 23rd August 2023.

Data analysis using SPSS for statistics. The chi square test was carried out to see whether there was a relationship between HSP and gender, hypertension, diabetes mellitus, and type of stroke. Analysis of the relationship between HSP with age and NIHSS was carried out using the t-test. Furthermore, to see the level of functional ability in the With HSP and without HSP groups, the chi square test was also carried out. The computer program in this research is SPSS version 20.

RESULT

From 200 stroke patients who came in August and September 2023, who met the inclusion and exclusion criteria and were willing to be surveyed was 78 people. From 78 samples surveyed, 18 (23%) people did not experience HSP and 60 (77%) people suffered from HSP.

Table 1. Clinical Factors That Influence HSP Post Stroke

	Total (n = 78)	HSP (n = 60)	Tanpa HSP (n = 18)	*p-value*
Usia (Tahun) (*X* ±*SD*)	61	60 ±10	62 ±9.8	0,492
Laki-laki *n (%)*	59 (76%)	46 (77%)	13 (72%)	0,700
Perempuan *n* (%)	19 (24%)	14 (23%)	5 (28%)	
Riwayat penyakit sebelumnya				
Diabetes Mellitus *n* (%)	24 (31%)	18 (30%)	6 (33%)	0,788
Hypertensi *n* (%)	21 (27%)	20 (33%)	1 (0.1%)	0,020
Jenis stroke				
Stroke Iskemik	67 (86%)	50 (83%)	17 (94%)	0,227
Stroke Hemoragik	11 (14%)	10 (17%)	1 (6%)	
Tingkat Keparahan Stroke				
NIHSS		6.85 ±4.64	4 ±4.98	0,028

Based on data on the characteristic samples, the average age was 61 years old with a range from 54 to 81 years old, gender was 59 (76%) male samples, type of stroke was 67 (86%) ischemic strokes, precipitating of disease-causing stroke were 24 (31%) for Diabetes Mellitus, 21% Hypertension. (27%), and the average severity level at the time of stroke based on the NIHSS was an average of 6.1 or mild neurological deficit.

Then the 78 samples were divided into 2 groups, namely The Group With HSP and the Group Without HSP. The results of statistical tests to see the relationship between HSP and sample characteristics showed that (1) p-value 0.492 for the relationship between HSP and age, which means there is no relationship between the incidence of HSP and the patient's age; (2) p-value 0.700 for the relationship between HSP and gender, which means there is no relationship between the incidence of HSP and the patient's gender; (3) p-value 0.788 on the relationship between HSP and factors precipitating Diabetes Mellitus, which means there is no relationship between the incidence of HSP and Diabetes Mellitus; (4) p-value 0.020 for the relationship between HSP and factors precipitating hypertension, which means there is a relationship between the incidence of HSP and hypertension; (5) p-value 0.227 for the relationship between HSP and type of stroke, which means there is no relationship between the incidence of HSP and type of stroke; and (6) p-

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value 0.028 in the relationship between HSP and NIHSS, which means there is a relationship between the incidence of HSP and stroke severity (NIHSS).

Table 2. The Level of Arm Disability

Category of Shoulder Pain and Disability	HSP (n = 60)	Tanpa HSP (n = 18)	*p-value*
Mild shoulder pain and disability - n (%)	13 (22%)	14 (78%)	0,000
Moderate shoulder pain and disability - n (%)	14 (23%)	2 (11%)	
Severe shoulder pain and disability - n (%)	18 (30%)	2 (11%)	
Very Severe shoulder pain and disability - n (%)	6 (10%)	-	
Extremely severe shoulder pain and disability - n (%)	9 (15%)	-	

Based on Table 2, results of the level of disability assessment using the Shoulder Pain and Disability Index (SPADI) in Table 2 showed that in the Group With HSP was 22% mild disability, 23% moderate disability, 30% severe disability, 10% very severe disability and 15% extremely severe disability. Meanwhile, in the Without HSP Group, 14% experienced mild disability, and 11% each moderate disability and severe disability. The statistical test results have a p-value of 0.000, which means there is a relationship between HSP and the level of disability.

Table 3. The Level of Motoric Performance

Category of FMA-UE	HSP (n = 60)	Tanpa HSP (n = 18)	*p-value*
Normal - n (%)	9 (15%)	12 (67%)	0,000
Decrease function - n (%)	49 (82%)	6 (33%)	
No Function - n (%)	2 (3%)	-	

Based on Table 3 show that motor performance in the group With HSP, 15% of samples were normal, 82% of samples had decreased function, and 3% had no motor function. Meanwhile, in the group without HSP, 67% were normal and 33% experienced decreased function. The p-value is 0.000 which indicates a relationship between HSP and the level of motor performance.

Table 4. The Level of Sensorics

Category of FMA-UE	HSP (n = 60)	Tanpa HSP (n = 18)	*p-value*
Normal - n (%)	18 (30%)	13 (72%)	0,050
Decrease function - n (%)	39 (65%)	5 (28%)	
No Function - n (%)	3 (5%)	-	

Based on Table 4 show that sensorics performance in the group With HSP, 30% of samples were normal, 65% of samples had decreased function, and 5% had no motor function. Meanwhile, in the group without HSP, 72% were normal and 28% experienced decreased function. The p-value is 0.050 which indicates a relationship between HSP and sensory abilities.

DISCUSSION

Based on the analysis of the characteristics of HSP sufferers, the incidence of HSP is related to the severity of stroke and predisposing factors of hypertension. In patients with hypertension, high blood pressure will damage capillary walls throughout the body, one of which is the shoulder area and will damage this tissue. Conditions of decreased arm function and lack of circulation can cause further tissue damage and cause shoulder pain (HSP). This is also related to the relationship between HSP and a high NIHSS value, which indicates a high level of stroke severity.

Other characteristics, namely age, gender, predisposing factors of Diabetes Mellitus, and type of stroke based on test results have no relationship to the incidence of HSP. Apart from that, the means in the two groups were not significantly different.

In this study, the level of disability and functional ability of the arm was also examined and related to the incidence of HSP. Based on the data analysis above, both the group with HSP and the group without HSP experienced post-stroke disability in the arm, although in the group without HSP most of the disabilities were mild, while in the group with HSP it was varies in all levels of disability from mild to extremely severe. For functional abilities, motor and sensory performance are examined. In the group with HSP, most of their motor and sensory performance experienced a decline, while in the group without HSP, most of their motor and sensory performance were normal.

Shoulder pain with decreased of arm function is like a vicious wheel that keeps spinning and is difficult to stop. When the arm function was decreases, there will be a shortening of all tissue structures in the shoulder

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girdle, namely ligaments, rotator cuff muscles and tendons. Apart from that, inflammation also occurs in the synovial tissue, where all of these conditions will put pressure on and damage the nerve tissue in the shoulder girdle, namely the innervation of the Brachial Nerve and Suprascapular Nerve. This condition causes pain in the shoulder. If there is pain, the patient will feel afraid to move the arm, and this will cause damage to the joint tissue to increase and the pain felt will also increase. This cycle of tissue damage must be stoped, the arm must continue to move to the extent of pain, tissue damage is repaired to reduce pain and ultimately optimal arm function will be achieved.

The condition of HSP greatly affects the quality of life of stroke patients, therefore assessment and prevention of HSP must be facilitated from the early phase. Another challenge is differentiating stroke-related shoulder pain from other types of shoulder pain. Other predisposing factors that can be considered for assessment are the presence of rheumatic disease or trauma. In stroke patients, impaired postural control and balance will increase the risk of falls, which ultimately causes shoulder pain.

Action that can be made to prevent shoulder pain are how to position the affected arm from early phase. In addition, how he families or health worker treat the affected arm when assisting the patient with mobilization and ambulation can cause HSP. HSP occurs because the ligaments in the shoulder joint loosen (hypotonus) thereby changing the alignment of the humeral head with the glenoid cavity, and when movement occurs in the direction of the humeral head it will hit the shoulder bursa and cause pain.

There are many physiotherapy modalities that can be used to treat HSP, from electrotherapy, shoulder manipulation, shoulder exercises and the use of passive stabilizers (tapping). This physiotherapy method is generally used for all cases of shoulder pain. Furthermore, further research is needed regarding the comparison of modalities to reduce pain and improve functional activity of the arm.

CONCLUSION

Nearly three-quarters of the 78 patients experienced HSP, the majority of whom suffered from moderate-severe pain. HSP limits patients' daily lives after stroke. The increased risk of HSP for patients with impaired arm function and/or low general status needs to be given attention in post-stroke care.

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