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Post-Stroke Shoulder Pain: Prevalence and Impact on Physiotherapy Adherence - A Cross-Sectional Study

Osama Khalid Raisan[1], Ziad Shafeeq Al-Rawi[2]

[1]MBChB, Iraqi Board for medical Specialization, Baghdad, Iraq

[2]FRCP(LONDON), Professor, College of Medicine, University of Baghdad and Consultant Rheumatologist, Baghdad Teaching Hospital, Baghdad, Iraq
Corresponding Author Email: *staffmember[at]yahoo.com*

Abstract: ***Background: Post-stroke shoulder pain (PSSP) is a common complication that interferes with recovery and rehabilitation participation. Objectives: To determine the prevalence, onset and severity of post-stroke shoulder pain, and to assess its association with physiotherapy adherence and exercise performance. Methods: A cross-sectional study of 108 stroke patients was conducted. Data on shoulder pain, its impact on daily activities, adherence rate, and exercise performance were analyzed using chi-square tests ($p < 0.05$). Results: Post-stroke shoulder pain was reported by 51.9% of participants, most commonly developing within 1–3 months post-stroke. Pain was predominantly moderate to severe (89.3%), and significantly affected daily activities (69.6%) and sleep (66.1%). Only sex showed a significant association with shoulder pain (female patients were more likely to develop shoulder pain after stroke compared to males), age, stroke type, stroke onset, and hemiplegic side were not significantly associated with shoulder pain. Physiotherapy adherence was low (34%), mainly due to lack of accompaniment and financial constraints. Shoulder pain was not significantly associated with appointment adherence ($p = 0.415$); however, pain severity was significantly associated with difficulty performing clinic-based ($p = 0.001$) and home-based ($p = 0.01$) exercises. Conclusions: Post-stroke shoulder pain is common. While shoulder pain did not significantly influence physiotherapy appointment adherence, pain intensity was a key determinant of exercise limitations.***

Keywords: Post-stroke shoulder pain, Prevalence, Physiotherapy adherence

1. Introduction

Stroke is a significant global health burden and a leading cause of disability, cognitive decline, and mortality worldwide[1]. It is the second leading cause of death after heart disease and the third leading cause of disability[2]. Low- and middle-income countries carry a great burden of stroke, which is higher than in high-income countries[3].

Post-stroke complications are frequent, may impede recovery, and can pose life-threatening risks[4]. The severity of post-stroke complications varies, ranging from temporary to permanent disabilities. These complications may include pain, paralysis, language and swallowing difficulties, and sensory deficits, which can ultimately result in psychiatric and cognitive impairments that profoundly affect patients' daily lives[5]. Hemiplegic shoulder pain (HSP) is among the most common and disabling complications observed after stroke. The prevalence of hemiplegic shoulder pain (HSP) in post-stroke patients has been reported to be as high as 84% and often remains elevated throughout the recovery period[6].

Rehabilitation constitutes a vital part of the continuum of care for stroke survivors, and comprehensive rehabilitation programs involving physiotherapy are crucial for maximizing functional recovery and improving post-stroke outcomes[7]. Adherence to rehabilitation regimens remains a major challenge in the management of stroke.[8]

Stroke is a clinically defined syndrome of sudden, focal neurological deficit caused by vascular injury to the central nervous system, either from cerebral infarction or intracranial hemorrhage. This results in brain tissue damage and subsequent loss of function [9]. It remains one of the principal cerebrovascular diseases and is a major contributor to neurological disability worldwide[9]. Within Iraq, the Global Burden of Disease 2019 Stroke Collaborators estimated the incidence of stroke to range between 196.2 and 218.3 per 100,000 population[10].

Hypertension is recognized as the most significant risk factor for stroke, followed by diabetes, overweight and obesity, smoking, alcohol consumption, unhealthy diet, hypercholesterolemia, cardiac arrhythmias, anemia, stress, urbanization, and physical inactivity. Implementation of effective stroke prevention strategies targeting these modifiable risk factors could significantly reduce both the incidence and prevalence of stroke[10,11].

Table 1: Frequencies of acute complications following stroke[4]

Complication	Range of frequencies (%)
Medical	
Aspiration pneumonia	7 ~ 22
Urinary tract infection	7 ~ 28
Deep vein thrombosis	0.6 ~ 6
Pulmonary embolism	0.6 ~ 18
Pressure ulcer	0.6 ~ 21
Malnutrition/Dehydration	2 ~ 16
Shoulder pain	2 ~ 27
Other pain	6 ~ 34
Depression	1 ~ 50
Fall	22 ~ 25
Neurologic	
Recurrent stroke	5 ~ 18
Epileptic seizure	2 ~ 5

Post-Stroke shoulder pain

Shoulder pain (Hemiplegic Shoulder Pain HSP) is a common and debilitating complication after stroke.[12] Studies have reported that the prevalence of HSP varies between 16 and 84%[13], while recent meta-analyses suggest an incidence between 10% and 22%.[12] Several predictors have been identified, including advanced age, female sex, improper handling, spasticity, sensory deficits, left-sided hemiparesis, hemorrhagic stroke, hemispatial neglect, past medical comorbidities, and poor National Institutes of Health Stroke Scale scores. Recognition of these risk factors are essential to reduce the likelihood of developing HSP[14].

HSP most commonly develops within 2–3 months of stroke onset[15]. Its consequences are substantial, often leading to reduced participation in rehabilitation programs, prolonged hospitalization, restricted upper limb mobility, and impaired functional recovery[14]. Long-term pain may further contribute to sleep disturbances, anxiety, depression, and overall decline in quality of life[15].

Rehabilitation Approaches in Stroke Care

Rehabilitation is an essential component of comprehensive stroke care. Its primary goal is to minimize functional impairments, maximize independence, and improve quality of life within the patient's living environment[16]. Rehabilitation programs also include secondary prevention strategies to reduce the risk of further complications[17].

Physiotherapy in the spectrum of rehabilitative care

A wide range of interventions are available in stroke rehabilitation, tailored to meet the specific needs of each patient. Among these, physical therapy is one of the most common forms of rehabilitative treatment. Physical therapy help stroke survivors improve strength, coordination, and balance with the aim of restoring independence in daily activities such as walking, dressing, and bathing[11]. Therapeutic strategies may include exercises, stretching, range of motion activities, and training in the use of mobility aids such as walkers or canes[11]. Physical rehabilitation not only enhances quality of life but also reduces or prevents common post-stroke complications. The choice of interventions is guided by the patient's impairments, activity limitations, and recovery goals. Rehabilitation exercises are directed toward maximizing both functional and psychological recovery, thereby overcoming barriers that hinder optimal health[11].

The other rehabilitation interventions involve, occupational therapy a vital component of post-stroke rehabilitation, focusing on helping patients regain independence in activities of daily living (ADLs) such as cooking, cleaning, and personal grooming[11]. This may include adapting the patient's environment, for example by installing grab bars in the bathroom, or providing adaptive equipment such as specialized utensils for eating[11]. Speech therapy is another key intervention, commonly used to restore communication skills and manage swallowing difficulties that may arise after stroke[11]. Additional therapeutic approaches may include music therapy, recreational therapy, and cognitive therapy, which further support functional and psychological recove[11]. The selection of specific interventions depends on the individual patient's needs and abilities. A comprehensive, multidisciplinary approach that integrates physical, occupational, and speech therapies is essential to maximize functional outcomes and promote independence[11].

Adherence as a Stroke rehabilitation challenge

According to the World Health Organization (WHO), adherence is defined as the extent to which patients' behaviors align with healthcare providers' recommendations, including medication use, dietary observance, lifestyle modification, and prescribed activities[8]. In the context of rehabilitation and physiotherapy, adherence is defined as the extent to which individuals perform a prescribed behavior accurately and at the agreed frequency, intensity, and duration. It is a multi-dimensional concept that may relate to attendance at appointments, following advice, undertaking prescribed exercises, the frequency of performing exercises, and carrying them out correctly, or doing more or less than advised[18]. In stroke care, rehabilitation exercise adherence specifically refers to the degree to which patients follow their prescribed exercise programs[19]. Evidence-based medicine has demonstrated that rehabilitation is the most effective strategy for reducing disability in stroke survivors, with exercise-based interventions being the preferred modality[20]. Early post-stroke rehabilitation exercises significantly improve clinical outcomes, and patients with high adherence show better limb function recovery, increased independence, and improved quality of life[8,21].

Despite these benefits, adherence to rehabilitation exercises among stroke patients remains a major challenge. During hospitalization, adherence rates range from 63% to 82%, but this decreases to approximately 47% after discharge[22]. Although patients often show good initial adherence, long-term adherence is generally poor, with many discontinuing their rehabilitation programs within six months. This substantially affects the rehabilitation process and overall treatment outcomes [21]. Many studies consider that hemiplegic shoulder pain can significantly reduce a patient's adherence to rehabilitation programs, sometimes leading to withdrawal, and consequently result in poorer functional outcomes[14,23].

2. Aims of study

- To determine the prevalence of post-stroke shoulder pain (PSSP) among stroke survivors.
- To evaluate the impact of PSSP on adherence to physiotherapy and overall participation in rehabilitation programs.

3. Patients and Methods

Study Design:

A descriptive cross-sectional study was conducted among patients diagnosed with ischemic or hemorrhagic stroke visited the Medical Rehabilitation and Rheumatic Diseases Center at Sader Al-Qanat, Tertiary Center in Baghdad, Iraq, between January 2025 and October 2025.

Sample Collection:
A total of 160 stroke patients who attended the Medical Rehabilitation and Rheumatic Diseases Center at Sader Al-Qanat were interviewed for this study.

Inclusion criteria:
- Adults aged equal or over 18 years,
- Diagnosed with either ischemic or hemorrhagic stroke based on neurologist referral reports from both governmental and private healthcare sectors.
- Mental competence was confirmed using the Abbreviated Mental Test Score[24].

Exclusion criteria:
- Patients with a history of shoulder problems prior to stroke,
- Individuals who were mentally incompetent,
- Individuals who declined to participate.

After applying these criteria, 52 patients were excluded from the study.

Thus, a total of 108 patients were included in the final analysis.

Sampling technique:
Participants were selected using a convenience sampling technique.

Data Collection:
Each participant was individually interviewed, and data were collected using a structured questionnaire was used to collect data across four domains, which was developed based on the references[25–27]. The first domain captured demographic characteristics, including age, sex, marital status, educational level, and occupation. The second domain recorded stroke-related clinical information: time since stroke onset, stroke type (ischemic or hemorrhagic) as documented in the referral report, and the affected body side.

The third domain assessed post-stroke shoulder pain. Participants with pre-existing shoulder conditions were excluded via an initial screening question. Pain presence, onset, and severity were evaluated using a numerical rating scale (0–10), [28] alongside its impact on activities of daily living, sleep quality, and analgesic use and effectiveness.

The fourth domain evaluated physiotherapy adherence. Attendance data- prescribed versus actual sessions attended- were extracted from rehabilitation records. Participants reported reasons for missed sessions, which encompassed shoulder pain, forgetfulness, lack of transportation assistance, intercurrent illness, financial barriers, prior treatment dissatisfaction, prolonged waiting times, and scheduling difficulties. The domain also assessed whether shoulder pain interfered with clinic-based or home-based therapeutic exercises.

Adherence Rate Calculation (Appointment keeping rating scale):
The adherence rate for each participant was calculated by dividing the total number of attended physiotherapy sessions by the total number of prescribed sessions during the rehabilitation period and multiplying the result by 100 to obtain a percentage. Participants who achieved an attendance score of ≥ 75% were classified as adherent, whereas those with an attendance score of < 75% were classified as non-adherent.

$$\text{Adherence Rate (\%)} = \left(\frac{N_{\text{attended}}}{N_{\text{prescribed}}}\right) \times 100$$

Where:
- N_{attended}= total physiotherapy sessions attended
- $N_{\text{prescribed}}$= total physiotherapy sessions prescribed

Adherent $\Leftrightarrow$ Adherence Rate $\geq 75\%$
Non-adherent $\Leftrightarrow$ Adherence Rate $< 75\%$

Ethical considerations
A formal consent was obtained from each participant prior to data collection after clearly explaining to them the purpose and objectives of the study. Participants were assured that their information would remain confidential and used solely for research purposes. The study protocol was reviewed and approved by the Iraqi Board for Medical Specializations, and official permission was granted according to document number and date (645 in 1/3/2025)

Statistical Analysis:
The data were analyzed using IBM SPSS Statistical Package for Social Sciences (Version 26). Categorical variables were presented as frequencies and percentages. The Chi-square test was applied to assess the association between categorical variables. A P-value of less than 0.05 was considered statistically significant.

4. Results

Characteristics of participants in the study
One hundred and eight patients were included in the study, the sociodemographic and clinical characteristics of the participants are shown in (Table 2) The majority of the participants were aged 41–64 years (50.9%), followed by those older than 65 years (45.4%), while only 3.7% were aged 18–40 years. Most participants were male (72.2%), and the predominant marital status was married (85.2%).

Educational level, the largest proportion had primary education (41.7%), followed by secondary education (28.7%), while 11.1% were illiterate and 15.7% held a bachelor's degree. Concerning working status, 32.4% were unemployed, 25.9% were housewives, 25.0% self-employed, and 16.7% worked in the government sector.

Clinically, most participants had ischemic stroke (84.3%), with hemorrhagic stroke representing 15.7%. The duration since stroke onset was predominantly 1–3 months (35.2%) and 3–6 months (35.2%), while 8.3% had a stroke less than one month ago, and 21.3% had it more than six months prior. The left side of the body was affected in 55.6% of cases, whereas the right side was affected in 44.4%.

Table 2: Characteristics of participants in the study

Variables	n (108)	%
Age (years)		
18–40	4	3.7
41–64	55	50.9
>65	49	45.4
Sex		
Male	78	72.2
Female	30	27.8
Marital Status		
Married	92	85.2
Single	7	6.5
Widowed	6	5.6
Divorced	3	2.8
Educational Level		
Illiterate	12	11.1
Primary school	45	41.7
Secondary school	31	28.7
Bachelor's degree	17	15.7
Postgraduate studies	3	2.8
Working Status		
Government sector	18	16.7
Self-employed	27	25
Housewife	28	25.9
Unemployed	35	32.4
Stroke Type		
Ischemic	91	84.3
Hemorrhagic	17	15.7
Stroke Onset		
Less than 1 month	9	8.3
1–3 months	38	35.2
3–6 months	38	35.2
More than 6 months	23	21.3
Body Side Affected		
Left	60	55.6
Right	48	44.4
No.=Number		

Prevalence and characteristics of shoulder pain among participants:
Out of the total 108 participants studied, 56 individuals (51.9%) reported shoulder pain, whom they were reported the following characteristics as shown in table 3.

Pain severity: mild pain (1-3) was reported by 6 participants (10.7%), moderate pain (4-6) by 24 participants (42.9%), and severe pain (7-10) by 26 participants (46.4%).

Shoulder pain developed within the first month after stroke in 13 patients (23.2%). The highest proportion of patients reported pain onset between 1 and 3 months post-stroke (41 patients; 73.2%). Only 2 patients (3.6%) developed shoulder pain between 3 and 6 months after stroke.

Concerning the effect of pain on general functioning, 39 participants (69.6%) indicated that shoulder pain affected their general activity, whereas 17 participants (30.4%) reported no interference. Similarly, the effect of pain on sleep was noted by 37 participants (66.1%), while 19 participants (33.9%) denied any impact of pain on sleep.

Table 3: Pain characteristics among 56 patients studied

Variable	Number (56)	%
Pain onset		
Within 1 month post stroke	13	23.2
1 month - 3 month post stroke	41	73.2
3 month - 6 month post stroke	2	3.6
Pain Severity		
Mild	6	10.7
Moderate	24	42.9
Severe	26	46.4
Pain effect on general activity		
No	17	30.4
Yes	39	69.6
Pain effect on sleep		
No	19	33.9
Yes	36	66.1

The association between shoulder pain and sociodemographic and clinical characteristics:
There were no significant association between age, Stroke type, or the affected body side with the occurrence of shoulder pain ($p > 0.05$).

However, sex showed a statistically significant association with shoulder pain ($p = 0.006$). Among males, 34 out of 78 (43.6%) experienced shoulder pain, whereas among females, 22 out of 30 (73.3%) reported shoulder pain. The results are summarized in table 4.

Table 4: The association between shoulder pain and sociodemographic and clinical characteristics among 108 studied patients

Variables	Shoulder Pain (n)	No Shoulder Pain (n)	P-value
Age (years)			
18–40	3	1	0.466
41–64	26	29	
>65	27	22	
Sex			
Male	34	44	0.006*
Female	22	8	
Stroke Type			
Ischemic	49	42	0.337
Hemorrhagic	7	10	
Body Side Affected			
Left side	33	27	0.464
Right side	23	25	
* Statistically significant ($P < 0.05$), (n) = number			

Adherence to Physiotherapy Appointments:
Among the participants who reported shoulder pain (n = 56), 19 patients (33.9%) were classified as adherent to physiotherapy sessions, while 37 patients (66.1%) were non-adherent.

Causes of non-adherence to Physiotherapy Appointments:
The results indicate that the most frequently reported reason was the lack of an accompanying person to help the patient get to the hospital (n = 30; 36.1%), followed by financial constraints for transport and treatment (n = 23; 27.7%), exacerbation of shoulder pain (n = 14; 16.9%), medical conditions (n = 12; 14.5%), forgetfulness (n = 3; 3.6%), and inconvenient treatment time (n = 1; 1.2%), as shown in Figure 3.

Table 5: Causes of non-adherence to physiotherapy appointments

Cause	Percentage (%)
No accompanying person to help the patient	36.1
Financial constraints for transport and treatment	27.7
Exacerbation of Shoulder pain	16.9
Medical conditions	14.5
Forgetfulness	3.6
Inconvenient treatment time	1.2

The association between adherence rate and shoulder pain as a cause of non-adherence:

The association between shoulder pain and physiotherapy adherence revealed no statistically significant association (P = 0.415), as shown in table 6.

Table 6: The association between adherence rate and shoulder pain

Adherence status	Other causes	Shoulder pain	Total
Adherent	13	6	19
Non-Adherent	29	8	37
Total	42	14	56
(p = 0.415) Non- significant			

Statistically significant (P < 0.05)

The association between shoulder pain severity and patient's exercise performance:

For clinic-based exercises, a significant association was observed between pain severity and exercise performance (P = 0.001). Among participants who reported that pain affected their exercise in the clinic, severe pain was most common (20 participants), followed by moderate pain (4 participants), while none reported mild pain. In contrast, participants who reported no effect were predominantly from the moderate pain group (20 participants), while fewer belonged to the severe (6 participants) and mild pain groups (6 participants).

Similarly, for home-based exercises, a significant association was found (P = 0.01). Participants whose pain affected their home exercises were predominantly those with severe pain (19 participants), followed by moderate pain (6 participants) and mild pain (1 participant). On the other hand, those who reported no effect were mostly moderate pain cases (18 participants), with fewer having severe pain (7 participants) and mild pain (5 participants), results shown in table 7.

Table 7: Association between pain severity and effect on exercise performance

		Mild	Moderate	Severe	Total	P-value
Clinic-based exercise	Yes	0	4	20	24	0.001 Significant
	No	6	20	6	32	
	Total	6	24	26	56	
Home-based exercise	Yes	1	6	19	26	0.01 Significant
	No	5	18	7	30	
	Total	6	24	26	56	

Statistically significant (P < 0.05)

5. Discussion

The present study demonstrated that most participants were middle-aged and elderly (96.3%). Likewise, Zeki Nooh reported a similar age distribution, with the majority of his patients being middle-aged and elderly (92.9%)[29].

Males represented 72.2% of the participants. This predominance likely reflects differences in healthcare access and participation, as men are more likely to attend rehabilitation centers independently, while cultural and social factors may limit female attendance rather than indicating a true sex difference in stroke prevalence.

Educational level in this study revealed that the majority of participants had low educational attainment (illiterate or primary school 52.8%). This finding is important because limited education often correlates with poor awareness of stroke risk factors and delayed medical consultation. Similarly, low socioeconomic status was reflected by the large proportion of unemployed and self-employed individuals (57.4%), which can influence access to healthcare and adherence to rehabilitation programs.

Ischemic stroke was predominantly (84.3%) reported in this study, which is comparable to the findings of Li et al. [15], who also reported that ischemic stroke was more common than hemorrhagic stroke among patients with hemiplegic shoulder pain. Hemorrhagic stroke (15.7%) in this study falls within the lower proportion noted by Li et al., confirming the typical distribution where ischemic stroke represents the majority of post-stroke patients[15].

In the present study, 56 out of 108 participants (51.9%) reported post-stroke shoulder pain (PSSP). This finding is comparable to the result reported by Li et al.[15] and falls within the range between 16 and 84% reported by El-Sonbaty et al.[13], Lindgren et al.[30] and Adey-Wakeling et al.[31].

In the present study, most patients (73.2%) developed shoulder pain within 1–3 months after stroke onset, indicating that pain commonly arises during the subacute stage of recovery. This finding is consistent with Zeki Nooh[29], who reported that most patients appeared during the second and third months post-stroke, and with Paolucci et al.[32] who found shoulder pain most frequently in the subacute phase (15–90 days) compared with the acute and chronic stages. In contrast, Zhu et al.[27] reported a later onset pattern, with 33% of patients developing shoulder pain between 3–6 months and 47.2% between 6 months and 1 year after stroke. These differences may be related to variations in patient selection, pain etiology, and the timing of clinical assessment. Overall, the findings of the present study agreed with many literatures[29,32], indicating that post-stroke shoulder pain typically emerges during the early recovery period.

Most patients in our study experienced moderate to severe shoulder pain (89.3%), indicating that post-stroke shoulder pain is generally of high intensity. This finding is consistent with Lindgren et al.[30] who reported that 79% of patients had moderate to severe shoulder pain, and with Fatima et al.[33] who also found that more than half of stroke patients experienced shoulder pain of moderate to severe intensity. Similarly, Paolucci et al.[32] reported moderate to high pain levels among post-stroke patients, while Aprile et al.[34]

observed a lower proportion (28.9%) of moderate to severe pain in subacute patients, possibly reflecting differences in pain assessment timing and rehabilitation phase. Overall, the predominance of moderate to severe pain across most studies emphasizes the need for early and targeted pain management during stroke rehabilitation to improve comfort, participation, and functional outcomes.

Additionally, shoulder pain affected daily activities in 69.6% of studied patients and disturbed sleep in 66.1% of them. These findings are consistent with Fatima et al.[33] who reported that shoulder pain after stroke impairs daily living activities and sleep in nearly half of affected patients. Similarly, Khatooni et al.[35] found a significant association between hemiplegic shoulder pain, decreased ability to perform daily tasks, and poor sleep quality. Furthermore, Li et al.[15] and Adey-Wakeling et al.[31] demonstrated that shoulder pain negatively affects quality of life and may hinder upper limb motor recovery. Overall, the current findings emphasize the importance of early intervention and comprehensive pain management during rehabilitation to improve patient's function and quality of life.

A significant association was found between sex and post-stroke shoulder pain ($p = 0.006$), with female patients more likely to develop HSP in this study compared to male patients. This aligns with the findings of Li et al.[15] who reported that females had a higher likelihood of developing hemiplegic shoulder pain than male patients. Similarly, El-Sonbaty et al.[13] observed a higher incidence of stroke and shoulder-related complications among females compared to male patients. In contrast, Zeki Nooh[29] reported equal male–female occurrence, and Westerlind et al.[36] found that sex did not significantly contribute to the development of shoulder pain. These differences across different studies may reflect variations in sample demographics, cultural factors influencing healthcare access, and methodological differences in identifying and reporting pain.

Age was not significantly associated with shoulder pain in the present study ($p = 0.466$). This finding agrees with Li et al.[15] finding who also reported no significant correlation between shoulder pain and age. Although Zeki Nooh[29] and Zhu et al.[27] observed that shoulder pain occurred more frequently in older compared to young patients, Hao et al.[37] similarly concluded that age was not an independent risk factor. Together, these findings suggest that while shoulder pain may appear more common in older age groups, age alone does not reliably predict its development.

Although the present study included an unequal number of stroke types, with ischemic cases exceeding hemorrhagic cases, Stroke type was not significantly associated with shoulder pain in the current study ($p = 0.337$). This result is consistent with Zeki Nooh[29] and Li et al. [15] who likewise found no significant relationship between shoulder pain and the type of stroke. In contrast, El-Sonbaty et al.[13] reported a higher occurrence of shoulder pain in ischemic stroke patients.

Similarly, the affected body side showed no significant association with shoulder pain ($p = 0.464$). This finding is consistent with Zeki Nooh[29] and Li et al. [15] who also reported no significant correlation between shoulder pain and the side of hemiplegia. In contrast, El-Sonbaty et al.[13] found that left-sided hemiplegia was more strongly associated with shoulder pain. Hao et al.[37] further noted that although laterality initially appeared important, subsequent analysis and meta-analytic evidence demonstrated that hemiplegic side is not an independent risk factor. Overall, these results suggest that body side alone is not a reliable predictor of hemiplegic shoulder pain.

The present study found that 66% of patients were non-adherent to their physiotherapy appointments, a result that closely aligns with Odetunde et al.[38] who also reported a high non-adherence rate of 65.2% among stroke survivors. In contrast, other studies have shown markedly higher adherence levels. Xing et al.[21] reported an average adherence rate of 68.6%.

The comparatively low adherence in the current study may reflect contextual barriers such as pain, transportation difficulties, limited social support, or low awareness of the importance of ongoing rehabilitation. These findings highlight the need for targeted strategies to enhance engagement and improve physiotherapy attendance among stroke survivors.

In the present study, the main barriers to physiotherapy adherence were the lack of an accompanying person (36.1%) and financial constraints (27.7%), followed by shoulder pain exacerbation (16.9%), medical comorbidities, and forgetfulness. These findings closely align with Ogwumike et al.[25] who also reported that absence of an accompanying person and financial difficulty were the most common reasons for missing appointments.

Shoulder pain, although less frequently reported than social and financial factors, still contributed to non-adherence for a notable proportion of patients. No studies were found that directly examined shoulder pain as a barrier to physiotherapy adherence, but previous evidence shows that shoulder pain negatively affects daily activities, sleep, and quality of life[15,31,33,35]. These limitations may reduce mobility and motivation to attend physiotherapy, making pain a plausible contributor to reduced adherence.

Overall, these findings highlight the importance of improving caregiver support, providing transportation or financial assistance, and using reminder systems to enhance adherence among stroke survivors.

In this study, no significant association was found between adherence rate and shoulder pain as a cause of non-adherence ($p = 0.415$). Although shoulder pain contributed to missed appointments for a small number of patients, other barriers—such as lack of accompaniment and financial difficulty- were much more prominent. This pattern aligns with the findings of Ogwumike et al. [25] and Odetunde et al. [38] who also reported social and economic challenges as the primary determinants of non-adherence among stroke survivors. Although previous studies have shown that post-stroke pain negatively influences rehabilitation participation[39], up to our knowledge, no study has directly examined shoulder pain as a specific barrier to

physiotherapy appointment adherence. The absence of a significant association in the present study may therefore reflect both the small sample size and the limited number of participants who reported pain as their main barrier. Overall, these findings suggest that adherence in this population is driven more by practical and social factors than by shoulder pain alone.

This study showed a significant association between shoulder pain severity and difficulty performing both clinic-based ($p = 0.001$) and home-based exercises ($p = 0.01$), with severe pain strongly linked to impaired exercise performance. This finding aligns with previous studies reporting that shoulder pain limits upper-limb function and reduces participation in rehabilitation[15,31]. Likewise, Fatima et al.[33] and Lindgren et al.[30] noted that moderate to severe pain leads to greater functional limitations. Importantly, Ademoyegun and Ibitoye[40] found that pain during exercise was associated with poor adherence to home-based exercise programs, supporting the present result that patients with severe pain struggle more with both supervised and home exercises.

6. Conclusions

- Post-stroke shoulder pain is relatively common, typically beginning within the first 1–3 months after stroke.
- Although shoulder pain contributed to some missed appointments, it was not significantly associated with physiotherapy adherence, while other social barriers plays larger role.
- Pain severity had a strong impact on exercise performance, with pain greatly limiting both clinic and home-based exercises.

Conflict of interest: The authors declare that They have no conflict of interest**.**

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