



(RESEARCH ARTICLE)



PREDICTORS OF THERAPEUTIC RESPONSE IN PATIENTS WITH SHOULDER PAIN AT THE DEPARTMENT OF PHYSICAL MEDICINE AND MEDICAL REHABILITATION, AIRLANGGA UNIVERSITY HOSPITAL, 2024

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ABSTRACT

Shoulder pain is a musculoskeletal disorder that can lead to functional limitations and reduced quality of life. This study aimed to identify predictors of therapeutic response in patients with shoulder pain treated at the Department of Physical Medicine and Medical Rehabilitation, Airlangga University Hospital. This retrospective analytical observational study used medical records of patients treated from January to December 2024. Of the 260 medical records reviewed, 219 met the inclusion criteria. Data collected included patient characteristics, clinical diagnoses, types of rehabilitation therapy, pharmacological therapy, and pain intensity measured using the Wong-Baker Scale. Multiple linear regression analysis, preceded by regression assumption testing, was performed to identify predictors of therapeutic response. Pain intensity decreased significantly after rehabilitation therapy ($p < 0.001$). Multiple linear regression analysis demonstrated that increasing age was associated with a poorer therapeutic response, whereas the use of nonsteroidal anti-inflammatory drugs (NSAIDs) was associated with a better therapeutic response. These findings suggest that rehabilitation therapy is effective in reducing pain intensity among patients with shoulder pain, and younger age and NSAID use are significant predictors of better therapeutic response. Identifying these predictors may help clinicians optimize treatment strategies and improve rehabilitation outcomes.

Keywords: Shoulder pain; Rehabilitation medicine; Therapeutic response; Predictors; Multiple linear regression.

1 INTRODUCTION

Shoulder pain is one of the most common musculoskeletal disorders and can interfere with daily activities, work productivity, sleep quality, and overall quality of life. It may result from abnormalities involving the bones, muscles, tendons, ligaments, or nerves around the shoulder, with common causes including frozen shoulder, rotator cuff disorders, shoulder impingement syndrome, bursitis, and muscle spasms [6,9]. The global prevalence of shoulder pain ranges from 7.7% to 62% per 1,000 people annually, while the prevalence in Indonesia has been reported to be 7.3% [4,7]. Despite the availability of various treatment options, shoulder pain remains a challenging condition because of its multifactorial etiology and variable clinical outcomes.

Rehabilitation medicine is the primary conservative approach for managing shoulder pain through therapeutic exercise, physical modalities, occupational therapy, and pharmacological treatment tailored to the patient's condition. However, therapeutic response differs among patients and may be influenced by demographic and clinical factors, including age, sex, body mass index, history of trauma, comorbidities, duration of symptoms, clinical diagnosis, and pharmacological therapy [3]. Identifying these predictors is important for optimizing individualized treatment strategies and improving rehabilitation outcomes.

Although several studies have investigated factors associated with treatment outcomes in patients with shoulder pain, evidence regarding predictors of therapeutic response in rehabilitation settings in Indonesia remains limited. Therefore, this study aimed to identify predictors of therapeutic response in patients with shoulder pain treated at the Department of Physical Medicine and Medical Rehabilitation, Airlangga University Hospital, in 2024. The findings are expected to support evidence-based clinical decision-making and improve the quality of rehabilitation services for patients with shoulder pain.

2 MATERIAL AND METHODS

2.1 Research Methods

This analytical observational study employed a retrospective design using medical records of patients with shoulder pain treated at the Department of Physical Medicine and Medical Rehabilitation, Airlangga University Hospital, in 2024. The study was conducted to identify predictors of therapeutic response.

2.1.1 Research subject

2.1.1.1 Inclusion Criteria

This study included patients diagnosed with shoulder pain, including frozen shoulder (ICD-10 M75.0), rotator cuff syndrome (M75.1), shoulder impingement syndrome (M75.4), shoulder osteoarthritis (M19.0), brachial plexus injury (S14.3), and bicipital tendinitis (M75.2), based on medical record data.

2.1.1.2 Exclusion Criteria

This study excluded patients with incomplete Wong-Baker Scale data or whose medical records did not specify the type of therapy.

2.1.2 Research variables

The independent variables included age, sex, occupation, body mass index (BMI), history of trauma, comorbidities, onset of pain, clinical diagnosis, type of physical exercise therapy, physical modalities, and use of pharmacological therapy (NSAIDs). The dependent variable was therapeutic response, measured by the change in Wong-Baker Scale pain scores before and after treatment.

2.1.3 Data Collection

The research data were obtained from the medical records of patients with shoulder pain who received rehabilitation therapy at the Department of Physical Medicine and Medical Rehabilitation, Airlangga University Hospital, from January to December 2024. Samples were selected using purposive sampling based on the predefined inclusion and exclusion criteria. Data collected included demographic and clinical characteristics, rehabilitation interventions, pharmacological therapy, and pain scores before and after treatment.

2.1.4 Data Analytics

The data were analyzed using RStudio software. Multiple linear regression analysis was used to identify characteristics that serve as predictors of treatment response. Before performing the regression analysis, assumption tests were conducted, including tests for normality, multicollinearity, heteroscedasticity, and linearity. A p-value < 0.05 was considered to indicate a statistically significant difference or relationship.

2.1.5 Research Ethics

This study was conducted in accordance with the principles of research ethics, including data confidentiality, anonymity, and beneficence. Patient confidentiality and identity were protected throughout the data collection, processing, and reporting processes. This study also prioritized scientific benefits and minimized potential risks to the research subjects.

2.2 Research Objectives

The objective of this study was to identify predictors of therapeutic response in patients with shoulder pain treated at the Department of Physical Medicine and Medical Rehabilitation, Airlangga University Hospital, in 2024.

Specifically, this study aimed to:

- Evaluate the association between age and therapeutic response.
- Evaluate the association between comorbidities, history of trauma, and therapeutic response.
- Evaluate the association between NSAID use and therapeutic response.
- Identify independent predictors of therapeutic response using multiple linear regression analysis.

The findings of this study are expected to provide evidence regarding factors associated with therapeutic response in patients with shoulder pain and to support evidence-based clinical decision-making in rehabilitation practice.

3 RESULTS

3.1 Patient Characteristic

A total of 219 patients with shoulder pain were included in the analysis. The majority of patients were aged >60 years (131 patients, 59.82%). Most patients had no history of trauma (191 patients, 87.21%). Regarding comorbidities, cardiovascular conditions were the most frequently documented, followed by metabolic, combined cardiovascular and metabolic, and neurological conditions. Most patients received therapeutic modalities, while physical exercise therapy was documented in 60 patients. NSAID use was documented in 18 patients.

Table 1: Demographic and Clinical Characteristics of Patients with Shoulder Pain Receiving Physical Medicine and Medical Rehabilitation, Airlangga University Hospital in 2024

SN.	Variable	n(%)
1	Age	
	<40 years	5 (2.28)
	41–60 years	83 (37.90)
	>60 years	131 (59.82)
2	History of trauma	
	with	28 (12.79)
	Without	191 (87.21)
3	Comorbidities	
	Cardiovascular	15 (6.85)
	Metabolic	10 (4.57)
	Cardiovascular and metabolic	14 (6.39)
	Neurological	7 (3.20)

4	Physical exercise therapy	
	Strength	23 (10.50)
	Flexibility	58 (26.50)
5	Therapeutic modalities	
	Low Level Laser Therapy	103 (47.00)
	Ultrasound Diathermy	96 (43.80)
	Trans Electrical Nerve Stimulation	60 (27.40)
	Short Wave Diathermy	48 (21.90)
	Infrared	3 (1.40)
6	Non-Steroidal Anti-Inflammatory Drugs	18 (8.22)

3.2 Therapeutic Response

A total of 219 patients were included in the analysis. The mean Wong-Baker Scale (WBS) pain score decreased from 4.95 before rehabilitation therapy to 3.22 after therapy, with a mean reduction of 1.73 points. The pain scores ranged from 1–10 before therapy and 0–8 after therapy.

Table 2: Patient response data before and after receiving Physical Medicine and Medical Rehabilitation, Airlangga University Hospital in 2024

SN.	Variable	Min-Max	Mean
1	WBS before therapy	1-10	4.95
2	WBS after therapy	0-8	3.22
3	Δ WBS (Change in pain score)	(-8)–10	1.73

WBS = Wong-Baker Scale

3.3 Predictors of Therapeutic Response

Regression diagnostic plots were analyzed to evaluate compliance with the assumptions of multiple linear regression. The residuals are comorbidities distributed around zero, indicating that the assumptions of linearity and homoscedasticity are met. The Q–Q plot also shows that the residuals are close to a normal distribution. Furthermore, no observations with excessive leverage were found. Based on these evaluation results, the assumptions of multiple linear regression were deemed to be adequately met, allowing the multiple linear regression analysis to proceed to identify independent predictors of therapeutic response.

The analysis results showed that age remained a significant predictor, with patients aged >60 years experiencing a smaller reduction in pain scores following rehabilitation therapy. NSAID use was also significantly associated with a better therapeutic response ($\beta = 3.129$, $p = 0.001$). In contrast, comorbidities and a history of trauma did not show a significant association with therapeutic response (all $p > 0.05$).

Table 3: Multiple linear regression analysis of predictors of therapeutic response

SN.	Variable	Regression Coefficient (β)	SE	t	p-value
1	Age	-0.024	0.012	-2.070	0.040
2	NSAID use	3.129	0.494	6.339	0.001
3	Comorbidity (cardiovascular)	-0.928	1.804	-0.515	0.607
4	Comorbidity (metabolic)	0.872	0.724	1.203	0.230
5	Comorbidity (Other)	1.690	1.799	0.939	0.349
6	History of trauma	-0.714	0.791	-0.903	0.368

NSAID = Non-Steroidal Anti-Inflammatory Drugs; BPH = Benign Prostatic Hyperplasia

4 DISCUSSION

This study demonstrated that rehabilitation therapy effectively reduced pain intensity in patients with shoulder pain. The significant reduction in Wong-Baker Scale scores after therapy suggests that rehabilitation interventions, including therapeutic exercises and physical modalities, were beneficial in improving patients' clinical outcomes. These findings are consistent with previous studies reporting that rehabilitation is an effective conservative treatment for shoulder pain [5].

Age was identified as an independent predictor of therapeutic response. Increasing age was associated with a smaller improvement in pain scores after rehabilitation therapy. This finding may be explained by age-related degenerative changes, reduced tissue healing capacity, decreased muscle strength, and impaired tendon remodeling, all of which can limit recovery during rehabilitation. Similar findings have been reported in previous studies, showing that older patients generally experience slower functional recovery and less favorable treatment outcomes [1].

NSAID use was also found to be a significant predictor of therapeutic response. Patients receiving NSAIDs experienced greater reductions in pain scores than those who did not receive these medications. NSAIDs reduce pain by inhibiting cyclooxygenase enzymes and decreasing prostaglandin synthesis, thereby reducing inflammation and facilitating patients' participation in rehabilitation exercises. Adequate pain control may improve adherence to rehabilitation programs and contribute to better clinical outcomes [2].

In contrast, comorbidities and history of trauma were not significantly associated with therapeutic response after adjustment for other variables. Although previous studies have suggested that these factors may influence rehabilitation outcomes, no significant association was observed in the present study. This finding may be related to the relatively small number of patients within certain comorbidity categories, differences in disease severity, or other unmeasured clinical factors that were not included in the analysis [8].

5 CONCLUSION

Based on the results of this study, it can be concluded that rehabilitation therapy is effective in reducing pain intensity in patients with shoulder pain. Multiple linear regression analysis demonstrated that age and NSAID use were significant predictors of therapeutic response. Increasing age was associated with a poorer therapeutic response, suggesting that older patients may experience slower recovery due to age-related degenerative changes and reduced tissue healing capacity. In contrast, patients who received NSAID therapy showed greater improvement in pain reduction, indicating that appropriate pharmacological management may enhance the effectiveness of rehabilitation therapy. Meanwhile, comorbidities and history of trauma were not significantly associated with therapeutic response in this study. These findings suggest that both patient characteristics and pharmacological therapy should be considered when planning rehabilitation programs. Identifying predictors of therapeutic response may help clinicians develop more individualized treatment strategies and optimize rehabilitation outcomes in patients with shoulder pain.

STATEMENTS ON COMPLIANCE WITH ETHICAL STANDARDS

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Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

This study used secondary data obtained from medical records, informed consent was managed in accordance with the provisions of the Health Research Ethics Committee of Universitas Airlangga Hospital. The study received ethical approval from the Health Research Ethics Committee of Universitas Airlangga Hospital (Approval No. 221/KEP/2025).

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