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Role of Physiotherapy in Improving Functional Outcomes and Quality of Life after Spontaneous Subarachnoid Haemorrhage

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ABSTRACT

Background

Spontaneous subarachnoid haemorrhage (SAH) is a life-threatening neurological emergency that often results in significant functional disability despite definitive surgical intervention. While microsurgical clipping secures the aneurysm, post-operative rehabilitation plays a crucial role in patient recovery. The role of physiotherapy in improving functional outcomes in these patients remains underexplored in low-resource settings. The objective of thi study is to evaluate the effect of physiotherapy on functional recovery in patients undergoing microsurgical clipping for spontaneous SAH.

Methods

This was a retrospective study conducted at Nobel Medical College Teaching Hospital, Biratnagar, Nepal, from February 2022 to January 2024. All patients who underwent microsurgical clipping received standardized in-hospital physiotherapy followed by home-based rehabilitation. Functional outcomes were assessed using the Functional Independence Measure (FIM) at post-operative baseline, discharge, and at 6-month follow-up.

Results

A total of 47 patients (34 males and 13 females) were included. At the 6-month follow-up, 70.2% of patients showed significant improvement in FIM scores, with marked gains in self-care, mobility, and cognitive domains. Patients who adhered to the prescribed physiotherapy regimen demonstrated significantly higher functional independence than those with irregular or poor physiotherapy compliance ($p < 0.01$). No adverse effects related to physiotherapy were reported.

Conclusions

Physiotherapy significantly contributes to the functional recovery of patients after microsurgical clipping for spontaneous SAH. Incorporating structured physiotherapy into the standard post-operative care pathway can enhance long-term outcomes, especially in resource-limited neurosurgical centres.

Keywords: Subarachnoid Haemorrhage; Microsurgical Clipping; Physiotherapy; Functional Independence Measure (FIM); Functional recovery; Nepal.

Correspondence: Dr. Narendera Prashad Joshi, Department of Physiotherapy, Nobel Medical College Teaching Hospital, Biratnagar, Nepal. Email:oshinaren01@gmail.com, Phone: +977-9820706602 **Article received**: 2025-10-07. **Article accepted**: 2026-01-12. **Article published**: 2026-03-31.

INTRODUCTION

Spontaneous subarachnoid haemorrhage (SAH) is a neurological emergency with significant morbidity and mortality.[1-2] Functional recovery after SAH is multifactorial and depends on the severity of haemorrhage, and the timing and quality of rehabilitation interventions.[3] Traditionally, post-SAH care has emphasized acute stabilization and surgical management, but increasing recognition is being given outcomes. The role of rehabilitation is crucial in optimizing neurological recovery.[3-4] This retrospective study aimed to evaluate the role of physiotherapy in improving functional outcomes and quality of life in patients who underwent microsurgical clipping for spontaneous SAH at Nobel Medical College over a two-year period. As a physiotherapy consultant involved in their continuum of care, this study reflects a growing effort to document and understand the contribution of physiotherapy interventions in complex neurosurgical recoveries. This study hopes to contribute valuable insights into the integration of physiotherapy into neurocritical care.

METHODS

This retrospective study was conducted to evaluate the impact of physiotherapy on functional outcomes and quality of life among patients who underwent microsurgical clipping for spontaneous subarachnoid haemorrhage (SAH). The study took place at the Department of Neurosurgery and the Physiotherapy Unit of Nobel Medical College Teaching Hospital (NMCTH) Biratnagar, Nepal a tertiary care centre providing comprehensive neurosurgical and rehabilitation services.

Ethical clearance was taken from the Institutional Review Committee (IRC) of NMCTH with (Ref. No-:01\2025). Patient data were collected over a two-year period, from February 2022 to January 2024, with functional and quality of life outcomes assessed at a six-month follow-up post-discharge.

Inclusion criteria for the study were adults aged 18 years and above who were diagnosed with spontaneous SAH, treated with microsurgical clipping, received inpatient physiotherapy during hospitalization, and continued physiotherapy post-discharge. These patients also completed at least six months of follow-up and had documented assessments of functional status and quality of life, with consent provided for the use of anonymized records. Exclusion criteria included patients treated with endovascular coiling or conservative management, those with traumatic SAH or secondary causes like AVMs, tumours, or infections, incomplete follow-up data, pre-existing major neurological disabilities, or missing physiotherapy documentation.

This retrospective study included patients selected based on predefined inclusion and exclusion criteria. Patient data were obtained from the hospital's neurosurgical database and physiotherapy records.

Data were analysed using descriptive and inferential statistics. Continuous variables were expressed as mean ± standard deviation, and categorical variables as frequencies and percentages. Pre- and post-rehabilitation FIM scores were compared using paired t-test. Pearson's correlation coefficient was applied to assess the relationship between FIM and mRS scores. A p-value < 0.05 was considered Statistically significant.

Functional outcomes were assessed using the FIM scale, a standardized 18-item tool that evaluates a patient's level of disability and care burden across domains such as self-care, mobility, communication, and social cognition. FIM scores were recorded at the time of hospital discharge and again at the six-month follow-up through outpatient visits. The primary indicator of physiotherapy effectiveness was the change in FIM scores from baseline to follow-up.

RESULTS

The final analysis included 47 patients, with spontaneous subarachnoid haemorrhage who underwent microsurgical clipping and completed six months of follow-up were included in the final analysis. Among these, 34 (72.3%) were male and 13 (27.7%) were female. The mean age of the study

population was 53.07 ± 11.44 years, ranging from 14 to 79 years. At the time of presentation, (62%) of the patients were classified as having good-grade SAH, with World Federation of Neurosurgical Societies (WFNS) grades I to III. The mean Glasgow Coma Scale (GCS) score on admission was 13.1 ± 2.3. Most aneurysms were located in the anterior circulation, with the anterior communicating artery (ACoM) being the most commonly involved site. The mean duration from ictus to surgery was 5.2 ± 2.6 days, and the average hospital stay was 12.4 ± 4.8 days. All patients received structured inpatient physiotherapy during hospitalization and were followed up via outpatient visits or tele-rehabilitation sessions after discharge.

Functional outcomes were evaluated using the Functional Independence Measure (FIM) scale, with scores recorded at discharge and at the six-month follow-up. A statistically significant improvement was noted in the FIM scores, as shown in (Table 1).

Table 1. Functional independence measure scale (n=47).

Time Point	Mean ± SD
At discharge	71.2 ± 9.4
At 6-month follow-up	109.7 ± 10.6
Mean gain in FIM	38.5
Statistical significance	p < 0.001

Sub-domain analysis revealed that the greatest improvements occurred in mobility and locomotion, particularly in transfers and walking, followed by self-care activities such as bathing and dressing. Notable gains were also observed in sphincter control and communication domains, particularly among patients who had lower FIM scores at baseline.

The Modified Rankin Scale (mRS) was also assessed at six months and correlated with the FIM scores. Patients who achieved mRS scores of 0 to 2, indicating functional independence, had mean FIM scores above 115. Those with mRS scores of 3 to 4, indicating moderate dependence, had FIM scores ranging from 90 to 110. Only two patients remained severely dependent with mRS scores of 5, and these individuals had FIM scores below 85. The relationship between mRS and FIM outcomes is summarized in (Table 2).

Table 2. The relationship between mRS and FIM outcomes (n=47).

mRS Score	Functional Category	Mean FIM Score
0–2	Independent	>115
3–4	Moderately dependent	90–110
5	Severely dependent	<85

A strong negative correlation was found between mRS and FIM scores at follow-up (Pearson's correlation coefficient r = -0.82, p <0.001), suggesting that improvements in FIM scores were associated with better functional recovery and reduced disability.

All patients received individualized physiotherapy interventions, which included early mobilization, balance and coordination training, muscle strengthening and endurance exercises, activities of daily living (ADL) training, and gait re-education. Patients who began physiotherapy within 48 to 72 hours postoperatively demonstrated significantly higher gains in FIM scores compared to those whose rehabilitation was initiated later, underscoring the beneficial impact of early physiotherapy initiation on long-term functional outcomes.

DISCUSSION

Spontaneous subarachnoid haemorrhage, predominantly caused by ruptured cerebral aneurysms, remains a life-threatening neurosurgical emergency, particularly in resource-limited settings. Despite the growing application of endovascular techniques in high-income countries, microsurgical clipping remains the mainstay of aneurysm management in many low- and middle-income countries such as Nepal due to cost-effectiveness, availability, and neurosurgical expertise.[5]

This retrospective study conducted at a tertiary-level centre in Nepal offers valuable insight into the outcomes of surgically treated SAH patients with a special focus on functional recovery assessed via the FIM and the role of physiotherapy in neurosurgical rehabilitation.

Our cohort included 47 patients, with a mean age

of 53.07 ± 11.44 years, highlighting that SAH tends to affect individuals in their most productive years. A male predominance (72.3%) was observed in our series, which is in line with certain population-based studies from Asia.[6] Notably, more than 60% of patients presented with a good WFNS grade (I–III), suggesting relatively preserved neurological function at the time of admission, which has a positive predictive value for better postoperative outcomes.[7]

Timely microsurgical clipping was performed with a mean interval of 5.2 ± 2.6 days post-ictus. This time frame reflects both logistical challenges and the prioritization of early intervention to prevent rebleeding. The mean hospital stay of 12.4 ± 4.8 days is consistent with global neurosurgical benchmarks for clipped SAH patients.[8]

The Functional Independence Measure (FIM), a validated outcome tool assessing physical, psychological, and social functioning across 18 domains, provided a robust framework for monitoring patient recovery. The mean FIM score increased from 71.2 ± 9.4 at discharge to 109.7 ± 10.6 at six months, representing a statistically and clinically significant functional gain. This supports earlier literature suggesting that SAH survivors can achieve substantial improvements in independence with multidisciplinary rehabilitation.[9]

Subscale analysis revealed marked improvements in mobility, locomotion, and self-care domains, which are commonly impaired following SAH due to hemiparesis, coordination deficits, or reduced endurance. These gains directly correlated with physiotherapy intervention protocols, which focused on early mobilization, progressive resistance training, balance retraining, and neurocognitive stimulation.

An important finding of this study is the strong inverse correlation ($r = -0.82$, $p < 0.001$) between FIM scores and Modified Rankin Scale (mRS) scores at six months. Patients with better FIM scores (≥115) had corresponding mRS grades 0-2, indicating functional independence, while those with lower FIM scores (<90) had mRS 3-5. This validates the use of FIM as a sensitive and objective measure of functional progress in SAH patients undergoing rehabilitation.[10]

The physiotherapy component of care proved integral to recovery in our cohort. Early engagement of physiotherapy (within 48-72 hours of surgery) was associated with higher FIM gains. Early mobilization has been shown to enhance neuroplasticity, prevent complications like deep vein thrombosis and pressure ulcers, and reduce hospital stay in neurosurgical patients.[11]

The structured neurorehabilitation program implemented for patients in this study was comprehensive and phase-based, aiming to optimize functional recovery following microsurgical clipping for subarachnoid haemorrhage. In the acute phase, emphasis was placed on proper positioning and bed mobility to prevent complications and facilitate early movement. As patients progressed, they were introduced to active-assisted and active range of motion (ROM) exercises to restore joint mobility and muscle function. Gait training was initiated using assistive devices when necessary, ensuring safe ambulation and improving lower limb coordination. In addition, task-oriented activities of daily living (ADL) training were provided to enhance independence in self-care tasks. Respiratory physiotherapy was also incorporated selectively, particularly in patients at risk of pulmonary complications, to support respiratory function and prevent secondary infections. This individualized and multidisciplinary approach formed the core of the rehabilitation strategy aimed at maximizing recovery and reintegration.

Such a comprehensive program aligns with international best practices, including those outlined in the American Physical Therapy Association's guidelines and the World Federation for Neuro-rehabilitation recommendations.[12, 13]

Previous studies, such as those by *DJ Nieuwkamp et al.*,[14, 15] have underscored the need for early and intensive rehabilitation in SAH survivors to improve quality of life and reduce long-term dependency. Our findings support these conclusions and emphasize

that even in resource-limited settings, structured physiotherapy can yield comparable outcomes, particularly when initiated early and individualized to patient needs.

Furthermore, integration of physiotherapists within neurosurgical departments, as practiced at our institute, enhances coordination and continuity of care. This model can serve as a reference for other centres in LMICs aiming to improve post-neurosurgical outcomes without over-reliance on expensive technology.

CONCLUSIONS

Physiotherapy plays an important role in promoting functional recovery in patients following microsurgical clipping for spontaneous subarachnoid hemorrhage. Early initiation of structured physiotherapy interventions can improve mobility, enhance functional independence, and contribute to better overall quality of life during the postoperative period. Rehabilitation strategies such as muscle strengthening, balance training, and functional mobility exercises help facilitate neurological recovery and prevent complications associated with prolonged immobilization. Integrating physiotherapy into the routine multidisciplinary postoperative care pathway can further improve long-term functional outcomes and spport earlier return to daily activities.

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Availability of data and materials

All data analysed during this study will be made available upon reasonable request from the corresponding author.

Authors' contributions

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