International Journal of Medical Science and Health Research

Vol.10, No.02; 2026

ISSN: 2581-3366

Factors Associated With the Mechanisms of Physiotherapy Contributions to Functional Recovery After Total Hip Arthroplasty at Professor Bocar Sidy Sall University Hospital, Kati

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doi: 10.51505/ijmshr.2026.10205 URL: http://dx.doi.org/10.51505/ijmshr.2026.10205

Received: Feb 06, 2026 Accepted: Feb 17, 2026 Online Published: Mar 07, 2026

Abstract

Introduction: Total hip arthroplasty (THA) involves the replacement of a damaged coxofemoral joint. The objective of this study was to investigate the factors associated with the mechanisms through which physiotherapy contributes to functional recovery after total hip arthroplasty at the University Hospital Center Pr Bocar Sidy Sall of Kati.

Materials and Methods: This was a cross-sectional study with prospective data collection conducted from April 1 to September 30, 2025. Sociodemographic characteristics, frequencies, univariate analysis, and logistic regression were performed to identify factors associated with functional recovery after total hip arthroplasty. Data analysis was carried out using SPSS software version 25.

Results: Among the 20 participants included in the study, the majority were women (65%), with a male-to-female ratio of 0.53. The age group ≥65 years accounted for the largest proportion of cases (40%), with a median age of 56 years (range: 28–90 years). Post-physiotherapy assessment showed that a walking distance of 500 m was predominant, observed in 45% of cases. The time to initiation of the first physiotherapy session and the number of sessions performed were the only factors statistically significantly associated with functional recovery of the lower limbs after total hip arthroplasty (THA) ($p < 0.05$).

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Conclusion: Combined with a structured and sufficiently intensive rehabilitation program and appropriate pain management, promotes significant improvement in functional abilities, particularly of the lower limbs, following total hip arthroplasty.

Keywords: Associated factors; mechanisms of functional recovery; total hip arthroplasty; University Hospital Center of Kati.

Introduction

Total hip arthroplasty (THA) consists of replacing the damaged coxofemoral joint. It reliably provides pain relief and functional improvement [1].

Its goal is to improve patients' quality of life by eliminating pain and increasing joint mobility. It has recently been described in The Lancet as the "surgical intervention of the century [1].

According to data collected by Cerboni and Domenighetti for the Swiss Health Observatory, approximately 40,000 total hip arthroplasties (THA) are implanted each year in Switzerland for diagnoses of primary hip osteoarthritis and femoral head osteonecrosis [2]. Total hip arthroplasty is the most commonly performed and well-mastered orthopedic procedure worldwide. In Gabon, it is performed at the Omar Bongo Ondimba Armed Forces Teaching Hospital and represents 10% of the activity of the orthopedic trauma department [3].

In Mali, according to a study conducted in Sikasso, the first total hip arthroplasties were performed recently as part of cooperation programs, with indications similar to those in other African countries. However, the lack of medical devices and the absence of specialized units still slow the widespread implementation of this surgery [4].

Physiotherapy is an essential component of the care pathway following total hip arthroplasty. It aims to restore mobility, muscle strength, motor coordination, and to promote a rapid return to autonomy [5]. In order to contribute to existing knowledge, this study aims to investigate the factors associated with the mechanisms through which physiotherapy contributes to functional recovery after total hip arthroplasty at Professor Bocar Sidy Sall University Hospital in Kati.

Methods

Study setting

This study was conducted in the orthopedic-traumatology surgery department and the physiotherapy unit of Professor Bocar Sidy Sall University Hospital (CHU Pr. BSS) in Kati.
The city of Kati is located 15 km from Bamako, Mali. It is part of the Koulikoro region and has a population of approximately 120,000 inhabitants. It hosts the Professor Bocar Sidy Sall University Hospital, located within Camp Soundiata Keita.

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The hospital was established in 1916 as a military infirmary. It became a hospital on August 22, 1967, a national hospital in 1968, and was specialized in traumatology in 1976. It was designated as a public administrative establishment by Law No. 920-25 of October 5, 1992, then as a public hospital establishment by Law No. 03-019 of July 14, 2003, and finally renamed Professor Bocar Sidy Sall University Hospital on November 16, 2016.

CHU Pr. BSS of Kati includes a total of 16 departments, notably orthopedic-traumatology surgery and physiotherapy departments (Hospital Development Plan 2014–2018). Its mission is to provide civil and military healthcare, ensure the management of patients, injured individuals, and pregnant women, and to participate in public health actions, training, and research in the health sector.

Orthopedic-traumatology department

The department consists of two inpatient wards, two operating rooms dedicated exclusively to clean surgery, and one septic operating room shared by all surgical departments.

Rehabilitation equipment

- Infrared lamps
- Vibromassage devices
- Electrostimulation devices
- Continuous passive motion (CPM) machines
- Stationary bicycles
- Motorized treadmills
- Weights for muscle strengthening
- Freeman balance boards

Study design and period

This was a cross-sectional study with prospective data collection conducted from April 1, 2025, to September 30, 2025.

Study population

All hospitalized and non-hospitalized patients who underwent total hip arthroplasty in the orthopedic-traumatology department and were followed up in the physiotherapy unit of CHU Pr. BSS of Kati.

Inclusion criteria

All patients who underwent total hip arthroplasty for any indication in the orthopedic-traumatology outpatient clinic and were followed up in the physiotherapy unit of CHU Pr. BSS of Kati, who were present during the study period and had complete medical records.

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Exclusion criteria

Patients followed in the physiotherapy unit who did not undergo total hip arthroplasty in the orthopedic-traumatology department of CHU Pr. BSS of Kati, those who underwent hemiarthroplasty of the hip, and patients who underwent total hip arthroplasty at CHU Pr. BSS of Kati but did not attend their physiotherapy sessions at the same hospital were excluded.

Sampling

An exhaustive sampling method was used, including all cases of total hip arthroplasty performed at Kati Hospital during the study period.

Data collection plan

Patient registers and medical records were used to complete part of the questionnaire. Data collection forms were administered during physiotherapy sessions, and some information was collected directly during these sessions.

Data analysis plan

Qualitative variables were expressed as proportions with their confidence intervals, while quantitative variables were expressed as means with standard deviations. Age was recoded, and the median age was calculated. The dependent variable was recoded as dichotomous. Variables with a p-value < 0.05 were included in the multivariate model. Parameters were calculated with 95% confidence intervals. A p-value < 0.05 was considered statistically significant. Data were entered using Microsoft Excel and analyzed with SPSS software version 25.

Ethical considerations

This study was conducted in strict accordance with ethical principles. Anonymity and confidentiality were ensured. Informed consent was obtained from all participants prior to inclusion in the study.

Results

Sociodemographic characteristics of patients who underwent total hip arthroplasty at Kati University Hospital

The majority of the study participants were women, accounting for 65% of cases, with a male-to-female sex ratio of 0.53. The age group ≥ 65 years represented the largest proportion of cases (40%), with a median age of 56 years (range: 28–90 years). Housewives accounted for 40% of the participants. Most participants were from rural areas, representing 75% of cases (Table 1).

Medical data and time to first physiotherapy session

"Other" mechanisms of occurrence were the most frequently reported, accounting for 60% of cases. Skin lesions were the only associated lesions observed in the sample. The right side was the most affected, representing 50% of cases. Hip osteoarthritis and femoral neck fracture were

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the most common indications, each accounting for 35% of cases. The majority of patients initiated their first physiotherapy session within 0 to 7 days after surgery (Table 2).

Evaluation of functional rehabilitation of the lower limbs after physiotherapy

A Visual Analog Scale (VAS) score ranging from 0 to 3, corresponding to mild pain, was observed in 100% of patients after physiotherapy. The majority of patients were able to ambulate independently, accounting for 85% of cases. A walking distance of 500 meters was predominant, observed in 45% of patients (Table 3).

Univariate analysis

In our study, variables such as age, time to the first physiotherapy session, number of physiotherapy sessions, and pain assessed using the Visual Analog Scale (VAS) showed a statistically significant association ($p < 0.05$) with functional recovery of the lower limbs (Table 4).

Multivariate analysis

In the multivariate analysis, after adjustment, the variables time to the first physiotherapy session and number of physiotherapy sessions remained statistically significant.

Patients who initiated physiotherapy 14 days after surgery had a 1.001-fold higher risk of delayed functional recovery of the lower limbs compared with those who started within 7 days. Patients who initiated physiotherapy 21 days after surgery had a 3.612-fold higher risk of delayed functional recovery of the lower limbs compared with those who started within 7 days. Patients who underwent 10 physiotherapy sessions after total hip arthroplasty had a 0.751-fold reduction in the risk of delayed functional recovery of the lower limbs compared with patients who received more than 15 sessions.

Patients who underwent 15 physiotherapy sessions after total hip arthroplasty had a 0.252-fold reduction in the risk of delayed functional recovery of the lower limbs compared with patients who received more than 15 sessions (Table 5).

Discussion

Sociodemographic characteristics of patients who underwent total hip arthroplasty at Kati University Hospital

Our study showed a female predominance among participants, with 65% women and a male-to-female sex ratio of 0.53. These findings are similar to those reported by Woolf AD et al. [6], who found prevalences of 9.6% in men and 18% in women over the age of 60. Similar results were also reported by Palazzo C et al. [7]. This female predominance may be explained by a higher life expectancy and a greater prevalence of musculoskeletal disorders among women. In Mali, the high prevalence of overweight among women (61.4%), as reported by Hamidou Oumar Bâ et al. [8], could be an important contributing factor to fracture mechanisms.

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The study population was predominantly elderly, with a substantial proportion of individuals aged 65 years and older (40%) and a median age of 56 years (range: 28–90 years). These findings are comparable to those reported by Deyo RA et al. [9] and Cisternas MG et al. [10], who emphasized that physiotherapy utilization mainly concerns older adults due to the high prevalence of chronic and degenerative conditions as well as age-related functional limitations.
From a socio-professional perspective, housewives accounted for 40% of cases. This reflects the socio-cultural context in Mali, where cultural perceptions often result in a large proportion of women being homemakers.

In our study, participants from rural areas were predominant (75%). This strong rural representation has also been described by Hoy D et al. [11], who reported that rural populations are more exposed to physically demanding labor, increasing the risk of musculoskeletal disorders. However, geographic remoteness from healthcare facilities and limited availability of specialized services in rural areas constitute major barriers to early and continuous physiotherapy care, potentially compromising functional outcomes.

Medical data, medical history, and time to first physiotherapy session
In our study, arterial hypertension (HTN) was the most frequently observed medical history, accounting for 69% of cases. This finding is consistent with the results of Ekouevi DK et al. [12], who also reported a high prevalence of hypertension among patients undergoing total hip arthroplasty. Hypertension is one of the most common comorbidities in candidates for total hip arthroplasty, particularly due to advanced age, metabolic syndrome, and sedentary lifestyle associated with severe hip osteoarthritis.

Benign prostatic hyperplasia was the most frequent surgical history, reported in 33% of patients. This high prevalence is expected, as this condition commonly affects men in the same age groups that are most frequently candidates for major orthopedic surgery.

In our study, mechanisms of occurrence classified as “other” were predominant, accounting for 60% of cases. Similar observations have been reported in other orthopedic surgery studies, including those by Smith et al. [9] in 2019 and Sánchez-Sotelo et al. [13] in 2021. This predominance suggests that multiple non-traumatic or indirect factors may be involved in the indication for total hip arthroplasty.

Skin lesions were the only associated lesions identified in our study. These may be related to delayed wound healing, superficial infection, or inflammatory reactions around the surgical scar. Even minor skin complications may delay functional recovery and require early physiotherapy management to prevent joint stiffness and scar adhesions.
The right side was slightly more affected, accounting for 50% of cases. This finding differs from that of Hawker et al. [14] in 2019, who reported a balanced distribution between the right and left sides.

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Regarding surgical indications, hip osteoarthritis and femoral neck fractures each accounted for 35% of cases. Hip osteoarthritis is the leading indication for total hip arthroplasty in most studies, representing between 30% and 60% of procedures depending on the country (Khan et al. [15], 2016; Weber et al. [16], 2020). Femoral neck fractures are also a common indication, particularly among older adults, especially in sub-Saharan Africa, where delays in management and bone fragility increase the risk of complications requiring arthroplasty [17].

The predominance of these indications can also be explained by improved access to prosthetic surgery and increasing life expectancy. With respect to laterality, the right side was most frequently affected in our series (50%). Some hypotheses suggest that functional dominance of the right side in most individuals may expose this joint to greater mechanical stress, favoring degenerative wear or traumatic risk.

In our study, most patients-initiated rehabilitation early, with the first physiotherapy session occurring within 0 to 7 days after surgery. This finding is consistent with those reported by Trudelle-Jackson et al. [18] and Artz et al. [19], who demonstrated that rehabilitation initiated within the first postoperative week promotes better recovery of joint mobility and functional independence. Early rehabilitation aligns with current recommendations following total hip arthroplasty, emphasizing that early mobilization reduces postoperative complications, improves functional recovery, and shortens hospital stay.

Evaluation of functional rehabilitation of the lower limbs after physiotherapy

In the present study, pain intensity assessed using the Visual Analog Scale (VAS) showed that after physiotherapy, 100% of patients reported mild pain (VAS score 0–3). Similar results were reported by Airaksinen et al. [20], who demonstrated that physiotherapy plays a major role in the management of musculoskeletal pain, with significant improvements in VAS scores following treatment.

This improvement may be explained by the combined effects of various physiotherapy techniques, including therapeutic exercises, joint mobilization, muscle relaxation techniques, and analgesic physical agents. These interventions reduce inflammatory processes, improve local circulation, and normalize movement patterns, thereby contributing to pain reduction.

Functional autonomy after total hip arthroplasty is a key indicator of rehabilitation effectiveness. In this study, independent ambulation with a slight limp was the most common outcome, observed in 85% of patients after physiotherapy.

This result reflects a notable improvement in mobility and functional independence, although the persistence of a slight limp indicates residual postoperative adaptations, likely related to muscle imbalances, residual pain, or compensatory motor strategies adopted to protect the operated joint [21]. Post-THA limping is often temporary but may persist if muscle strengthening, particularly of the hip abductors and extensors, is incomplete [22].

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Nevertheless, the predominance of independent ambulation suggests that physiotherapy was effective in restoring gait through the integration of strengthening, proprioceptive, and postural control exercises. Targeted post-THA rehabilitation programs have been shown to reduce dependence on walking aids and promote rapid functional recovery [23].

In this study, a walking distance of 500 meters was predominant, reported by 45% of patients after physiotherapy. This distance indicates satisfactory functional recovery, allowing patients to perform most activities of daily living, such as household mobility, shopping, and social participation. This finding is consistent with that of Topp et al. [24], who showed that functional training and targeted strengthening of the hip abductors and extensors significantly increase walking distance and improve locomotion quality after THA.

Univariate analysis

In our study, several variables, including age, time to the first physiotherapy session, number of sessions completed, and pain level assessed using the VAS, were significantly associated ($p < 0.05$) with functional recovery of the lower limbs. These results highlight the multifactorial nature of functional recovery in rehabilitation and confirm the importance of early, tailored, and sufficiently intensive physiotherapy management.

Age showed a significant association with functional recovery. Our findings are consistent with those of Frontera WR et al. [25] and Dodds RM et al. [26], who reported that aging is associated with a decline in muscle mass, strength, joint flexibility, and neuromotor capacity, which may slow recovery mechanisms. Nevertheless, well-conducted rehabilitation can still yield significant functional gains even in older adults.

Time to initiation of physiotherapy was also significantly associated with functional recovery. Early management is recognized as a key determinant of rehabilitation effectiveness, as it helps prevent secondary complications such as joint stiffness, muscle atrophy, and persistent functional impairments. Conversely, delayed initiation of physiotherapy may compromise functional prognosis.

The number of physiotherapy sessions was another factor significantly associated with functional recovery. Adequate intensity and duration of rehabilitation are essential to induce durable neuromuscular and functional adaptations. Structured rehabilitation programs with an appropriate number of sessions are associated with better functional outcomes compared with insufficient or prematurely discontinued interventions.

Pain, as assessed by the VAS, was significantly related to functional recovery. Pain is a major barrier to active mobilization, patient engagement in therapeutic exercises, and adherence to rehabilitation programs. Effective pain management is therefore essential to optimize functional performance and promote motor recovery.

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Multivariate analysis

Multivariate analysis showed that after adjustment for confounding factors, time to the first physiotherapy session and the number of sessions performed remained the only factors significantly associated with functional recovery of the lower limbs after total hip arthroplasty. These findings highlight the close relationship between physiotherapy rehabilitation and functional recovery. Early, continuous, and quantitatively adequate physiotherapy appears essential to optimize functional outcomes after THA. They also emphasize the need to implement standardized postoperative rehabilitation protocols adapted to local contexts and available resources in order to reduce the risk of delayed functional recovery.

Conclusion

Functional recovery through physiotherapy is a central objective of the rehabilitation process, aiming to restore autonomy, mobility, and quality of life. Early initiation of physiotherapy, combined with a structured and sufficiently intensive program and appropriate pain management, promotes significant improvement in functional capacity, particularly of the lower limbs following total hip arthroplasty.

Funding

This study did not receive any specific funding.

Acknowledgements

The authors would like to thank the staff of Kati University Hospital for their support in data collection.

Conflicts of interest

The authors declare no conflicts of interest.

Authors' contributions

MB was responsible for data collection. ST, MPK was responsible for data analysis, interpretation of the results, and manuscript preparation. SSD supervised the development of the study protocol, data collection, data analysis, and manuscript writing. The authors also wish to thank all staff members of the National Institute of Public Health (INSP) for their support.

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Table 1: Sociodemographic characteristics of patients who underwent total hip arthroplasty at Kati University Hospital (n = 20)

Characteristic	Category	Frequency	Percentage (%)
Sex	Female	13	65
	Male	7	35
Age (years)	20–35	3	15
	35–50	6	30
	50–65	3	15
	≥ 65	8	40
Occupation	Civil servant	4	20
	Housewife	8	40
	Farmer	5	25
	Trader	3	15
Place of residence	Rural	15	75
	Urban	5	25

Table 2. Distribution of patients according to medical data and time to first physiotherapy session (n = 20)

Characteristic	Category	Frequency	Percentage (%)
Mechanism of occurrence	Domestic accident	4	20
	Road traffic accident (RTA)	4	20
	Other	12	60
Associated lesions	Skin	4	100
Side affected	Right	10	50
	Left	9	45
	Bilateral	1	5
Surgical indication	Hip osteoarthritis	7	35
	Femoral neck fracture	7	35
	Disabling femoral head osteonecrosis	4	20
	Other	1	5
	Failed corrective surgery with persistent painful functional limitation	1	5
Time to first physiotherapy session	0–7 days	17	85
	8–14 days	2	10
	15–21 days	1	5

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Table 3. Evaluation of functional rehabilitation of the lower limbs after physiotherapy (n=20)

Characteristic	Category	Frequency	Percentage (%)
Pain intensity (VAS)	0–3 (mild pain)	20	100
	3–5 (moderate pain)	0	0
Type of ambulation	Independent	17	85
	With assistive device	3	15
Walking distance	50 m	1	5
	100 m	2	10
	200 m	3	15
	500 m	9	45
	>500 m	5	25

Table 4. Relationship between selected variables and the contributions of physiotherapy in patients undergoing total hip arthroplasty at Kati University Hospital (n=20)

Characteristic	**Physiotherapy outcome**		**p-value**
	Satisfactory	Unsatisfactory	
Age (years)			
20-35	3(17,60%)	0(0%)	
35-50	4(23,50%)	2(66,70%)	
50-65	3(17,60%)	0(0%)	
≥ 65	7(41,20%)	1(33,30%)	
Total	17(100%)	3(100%)	0,03
Sex			
Female	10(58,80%)	3(100%)	
Male	7(41,20%)	0(0%)	
Total	17(100%)	3(100%)	0,521
Occupation			
Civil servant	4(23,50%)	0(0%)	
Housewife	6(35,30%)	2(66,70%)	
Farmer	5(29,40%)	0(0%)	
Trader	2(11,80%)	1(33,30%)	
Total	17(100%)	3(100%)	0,449
Place of residence			
Rural	13(76,50%)	2(66,70%)	

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Urbain	4(23,50%)	1(33,30%)	
Total	17(100%)	3(100%)	1,001
Time to first physiotherapy session			
7 days	14(82,40%)	3(100%)	
14 days	2(11,80%)	0(0%)	
21 days	1(5,90%)	0(0%)	
Total	17(100%)	3(100%)	0,04
Medical history			
Stroke	1(5,90%)	0(0%)	
Ischemic stroke	0(0%)	1(33,30%)	
Diabetes	1(5,90%)	0(0%)	
Hypertension (HTN)	6(35,30%)	2(66,70%)	
None	8(47,10%)	0(0%)	
Acute rheumatic disease	1(5,90%)	0(0%)	
Total	17(100%)	3(100%)	0,284
Mechanism of occurrence			
Domestic accident	5(29,40%)	1(33,30%)	
Road traffic accident (RTA)	6(35,30%)	1(33,30%)	
Malformation	6(35,30%)	1(33,30%)	
Total	17(100%)	3(100%)	1,001
Number of physiotherapy sessions			
10 sessions	5(29,40%)	1(33,30%)	
15 sessions	8(47,10%)	2(66,70%)	
>15 sessions	4(23,50%)	0(0%)	
Total	17(100%)	3(100%)	0,001
Pain (VAS)			
0–3 (mild pain)	9(52,90%)	0(0%)	
3–5 (moderate pain)	8(47,10%)	3(100%)	
Total	17(100%)	3(100%)	0,02

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Table 5. Factors associated with the contributions of physiotherapy to functional recovery after total hip arthroplasty at Kati University Hospital

Characteristic	Adjusted OR	95% CI (Lower – Upper)	p-value
Age (years)			
20–35	ref		
35–50	0.691	0.125 – 2.234	0.999
50–65	3.589	0.236 – 51.899	0.363
≥ 65	0.96	0.561 – 4.461	0.999
Time to first physiotherapy session			
7 days	ref		
14 days	1.001	0.598 – 3.999	0.04
21 days	3.612	1.562 – 5.481	0.03
Number of physiotherapy sessions			
>15 sessions	ref		
10 sessions	0.751	0.252 – 0.899	0.001
15 sessions	0.252	0.012 – 0.589	0.03
Pain (VAS)			
0–3 (mild pain)	ref		
3–5 (moderate pain)	0.375	0.101 – 1.23	0.147