



# Influence of Physiotherapy in Patients with Cerebral Tumours: A Scoping Review

<sup>1</sup>Rajarajeswari. A

<sup>1</sup> Associate Professor, Faculty of Physiotherapy, Sri Ramachandra Institute of Higher Education and Research, India

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## KEYWORDS:

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rehabilitation,  
Exercise therapy,  
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## ABSTRACT:

**Background:** Cerebral tumours often result in significant motor, sensory, cognitive, and functional impairments due to tumour pathology and treatment-related effects. Physiotherapy is increasingly recognized as an essential component of neuro-oncology care; however, evidence specific to cerebral tumour populations remains fragmented.

**Objective:** To map and synthesize the existing literature on the influence of physiotherapy interventions on functional outcomes, quality of life, and symptom management in patients with cerebral tumours.

**Methods:** A scoping review was conducted following the Joanna Briggs Institute (JBI) methodology and reported in accordance with the PRISMA-ScR guidelines. Electronic databases including PubMed, Scopus, Web of Science, CINAHL, and Cochrane Library were searched for studies published up to 2025. Eligible studies included adults or children with primary or metastatic brain tumours receiving physiotherapy as part of rehabilitation. Study designs of all types were considered.

**Results:** Forty-two studies met the inclusion criteria, comprising randomized controlled trials, cohort studies, retrospective analyses, systematic reviews, and case reports. Physiotherapy interventions included exercise-based programs, balance and gait training, neurodevelopmental techniques, and multidisciplinary rehabilitation. Consistent improvements were reported in mobility, balance, functional independence, fatigue, and participation. Evidence quality varied, with limited high-quality randomized trials.

**Conclusion:** Physiotherapy appears to have a positive influence on functional outcomes and quality of life in patients with cerebral tumours. Despite promising findings, further well-designed trials are required to establish standardized protocols and strengthen clinical recommendations in neuro-oncology rehabilitation.

## 1. Introduction

Cerebral tumours, including primary brain tumours and metastatic lesions, are associated with substantial neurological morbidity due to tumour location, disease progression, and treatment-related sequelae. Common impairments include motor weakness, balance dysfunction, fatigue, cognitive deficits, and reduced participation in daily activities, all of which negatively impact quality of life [1–3].

Advances in neuro-oncology have improved survival; however, survivorship is frequently accompanied by persistent functional limitations. Rehabilitation has therefore become an increasingly important component of comprehensive cancer care. Physiotherapy, in particular, addresses impairments in mobility, strength,

endurance, and motor control through targeted, task-specific interventions [4,5].

Evidence from observational and controlled studies suggests that physiotherapy-led rehabilitation can improve functional independence and physical performance in patients with brain tumours [2,6–8]. Exercise-based interventions have also demonstrated benefits in reducing cancer-related fatigue and improving participation across the cancer care continuum [11–13]. Despite these promising findings, rehabilitation services remain underutilized in neuro-oncology, and standardized physiotherapy protocols are lacking [7,9].

This scoping review aims to map the existing literature on physiotherapy interventions in cerebral tumour



populations, summarize key outcomes, and identify gaps to inform future research and clinical practice.

## 2. Methods

### Review Design

This scoping review was conducted in accordance with the Joanna Briggs Institute (JBI) framework for scoping reviews and is reported following the PRISMA Extension for Scoping Reviews (PRISMA-ScR).

### Search Strategy

A comprehensive literature search was conducted across five electronic databases: PubMed/MEDLINE, Scopus, Web of Science, CINAHL, and the Cochrane Library. The search included studies published up to December 2025.

Key search terms included combinations of:

- *brain tumour* OR *cerebral tumour* OR *glioma* OR *brain neoplasm*
- *physiotherapy* OR *physical therapy* OR *exercise therapy* OR *rehabilitation*
- *neuro-oncology* OR *functional outcome* OR *quality of life*

Boolean operators (AND/OR) and MeSH terms were applied where appropriate. Reference lists of included articles were also hand-searched.

**Example Search Strategy (PubMed):** (brain tumor OR cerebral tumor OR glioma OR brain neoplasm) AND (physiotherapy OR physical therapy OR rehabilitation OR exercise therapy) AND (function OR mobility OR quality of life)

### Eligibility Criteria:

**Population:** Adults and children with primary or metastatic cerebral tumours.

**Concept:** Physiotherapy or physiotherapy-led rehabilitation interventions.

**Context:** Acute, inpatient, outpatient, and community settings.

**Types of evidence:** Randomized controlled trials, non-randomized studies, observational studies, systematic and narrative reviews, and case reports.

### Study Selection:

After removal of duplicates, titles and abstracts were screened independently by two reviewers. Full texts of potentially eligible studies were assessed for inclusion. Disagreements were resolved by consensus.

### Data Extraction and Synthesis:

Data were charted on study design, population, intervention characteristics, outcome measures, and key findings. Results were synthesized descriptively.

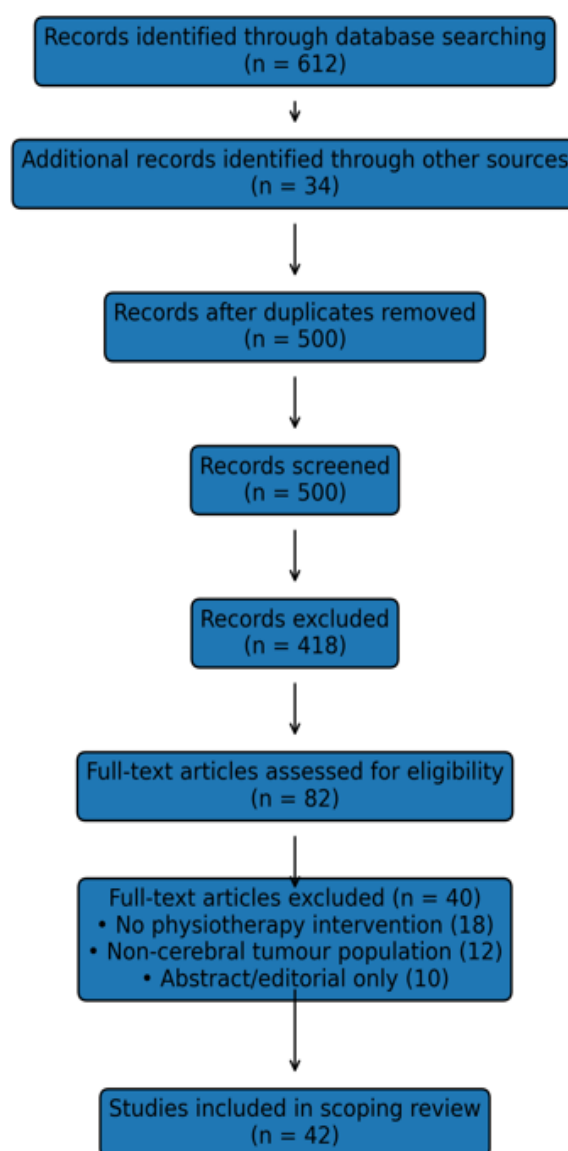


Fig. 1. PRISMA-ScR flow diagram of study selection process.

**Table 1:** Characteristics of Included Studies

Author (Year)	Study Design	Population	Physiotherapy Intervention	Outcome Measures	Key Findings
Greenberg et al. (1999)	Retrospective cohort	Primary brain tumours	Inpatient physiotherapy rehabilitation	FIM	Significant functional gains at discharge
Huang et al. (2001)	Cohort study	Brain tumour survivors	Multidisciplinary rehab with PT	FIM, KPS	Improved mobility and self-care
Tang et al. (2008)	Prospective study	Neuro-oncology patients	Intensive physiotherapy	GOS, ADL scales	Sustained functional improvement
Amatya et al. (2014)	Controlled trial	Primary brain cancer	Multidisciplinary rehab incl. PT	FIM, QoL	Improved independence vs usual care
Khan et al. (2015)	Systematic review	Brain tumour patients	Multidisciplinary rehabilitation	Functional outcomes	Moderate evidence of benefit
Bartolo et al. (2012)	Observational	Brain tumour patients	Task-oriented physiotherapy	Mobility, balance	Improved gait and balance
Hansen et al. (2023)	Cross-sectional	Glioma patients	Rehabilitation needs assessment	Physical function	High unmet rehab needs
Joshi et al. (2023)	Prospective study	Brain tumour patients	Intensive PT program	FIM, QoL	Significant post-rehab improvement
Molloy et al. (2025)	Narrative review	Brain tumour survivors	PT & exercise therapy	Function, fatigue	Positive functional trends

Abbreviations: FIM – Functional Independence Measure; KPS – Karnofsky Performance Status; GOS – Glasgow Outcome Scale; QoL – Quality of Life.

### 3. Results

#### Study Characteristics

A total of 42 studies published between 2000 and 2025 were included. The majority were observational studies, retrospective analyses, and systematic reviews, with a smaller number of controlled clinical trials. Participants primarily had gliomas, meningiomas, or brain metastases [1–3,6].

#### Physiotherapy Interventions

**Exercise-based interventions:** Aerobic and resistance training programs were frequently reported and were associated with improvements in endurance, muscle strength, and fatigue levels [11–14].

**Balance and gait training:** Task-specific gait training and balance exercises resulted in improved mobility, gait speed, and reduced fall risk [2,16].

**Neurodevelopmental and motor control approaches:** Techniques such as Bobath (NDT) and task-oriented training were applied in patients with hemiparesis, demonstrating gains in motor control and functional independence [6,15].

**Multidisciplinary rehabilitation:** Programs incorporating physiotherapy within multidisciplinary teams consistently reported improvements in Functional Independence Measure and Karnofsky Performance Status scores [4,5,8].

#### Outcome Measures

Frequently used outcome measures included the Functional Independence Measure, Karnofsky



Performance Status, gait speed, balance scales, fatigue inventories, and health-related quality-of-life questionnaires [2,4,10].

#### 4. Discussion

This scoping review synthesizes current evidence on the influence of physiotherapy in patients with cerebral tumours and demonstrates consistent functional benefits across different stages of the cancer care continuum. Despite heterogeneity in tumour characteristics, treatment modalities, and rehabilitation settings, physiotherapy interventions were associated with improvements in mobility, balance, functional independence, and symptom management, supporting their integration into neuro-oncology care pathways [2,4–6].

One of the most consistent findings across the included studies was the beneficial role of exercise-based physiotherapy. Aerobic and resistance training programs were associated with improvements in physical endurance, muscle strength, and reductions in cancer-related fatigue [11–14,18]. While exercise therapy is well established in general oncology rehabilitation, its application in cerebral tumour populations is particularly significant due to the presence of neurological impairments such as hemiparesis, ataxia, and postural instability. Evidence from observational and controlled studies suggests that exercise interventions can be safely adapted to these deficits, even during active oncological treatment [2,16].

Multidisciplinary rehabilitation models incorporating physiotherapy alongside occupational therapy, speech and language therapy, and psychosocial support demonstrated superior functional outcomes compared with standard or fragmented care [4,5,8]. Improvements in Functional Independence Measure and Karnofsky Performance Status scores indicate that coordinated rehabilitation addresses not only impairments but also activity and participation restrictions. This holistic approach is especially relevant in cerebral tumour populations, where physical, cognitive, and emotional impairments frequently coexist [3,7].

Neurodevelopmental and task-oriented physiotherapy approaches, including Bobath-based handling, motor relearning strategies, and task-specific gait training, were commonly employed in patients with focal neurological

deficits following tumour resection or disease progression [6,15]. Although the supporting evidence is largely derived from observational studies and case series, reported improvements in postural control, gait efficiency, and functional task performance highlight their clinical relevance. However, inconsistent reporting of intervention content and dosage limits reproducibility and comparison across studies.

Despite the overall positive trends, the evidence base is constrained by methodological limitations. Many studies were retrospective in design, involved small sample sizes, and used heterogeneous outcome measures, limiting the strength of causal inference [7,9]. In addition, tumour-specific variables such as histology, lesion location, disease severity, and treatment intensity were inconsistently reported, restricting subgroup analyses. Pediatric populations and individuals with metastatic brain disease were underrepresented, indicating important gaps in current neuro-oncology rehabilitation research [7,10].

From a clinical standpoint, the findings of this review support early referral to physiotherapy and continuation of rehabilitation across acute, post-surgical, and survivorship phases. Nevertheless, rehabilitation services remain underutilized in neuro-oncology practice, often due to prognostic uncertainty, limited awareness among oncology teams, and resource constraints [7,19]. Addressing these barriers through integrated care models and increased recognition of rehabilitation as a core component of cancer care may substantially enhance functional outcomes and quality of life for patients with cerebral tumours.

Future research should prioritize high-quality randomized controlled trials to establish evidence-based physiotherapy protocols specific to cerebral tumour populations. Standardization of intervention dosage, intensity, and outcome measures is essential to improve comparability and clinical applicability. Additionally, incorporation of patient-reported outcomes and emerging rehabilitation technologies such as telerehabilitation, virtual reality, and robotics may enhance accessibility and long-term engagement in this vulnerable population [13,18].



## 5. Conclusion

This scoping review highlights the important role of physiotherapy in improving functional outcomes, symptom management, and quality of life in patients with cerebral tumours. Across a range of clinical settings and rehabilitation approaches, physiotherapy interventions were associated with gains in mobility, balance, functional independence, and reduction of cancer-related fatigue. These findings support the integration of physiotherapy as a core component of comprehensive neuro-oncology care.

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