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Title: The Role of Community-Based Rehabilitation in Post-Earthquake Recovery: A Systematic Review

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Abstract

Background. Earthquakes can cause substantial injuries and long-term disabilities, particularly in low-resource settings where access to specialized rehabilitation is limited. Community-based rehabilitation (CBR) may help address these gaps by using local resources and improving access to rehabilitation services. However, the evidence regarding the role of CBR in improving functional, psychosocial, and social outcomes after earthquakes has not been systematically synthesized. Therefore, this systematic review asked: What evidence exists regarding the effectiveness, implementation characteristics, and barriers of CBR interventions for earthquake survivors, particularly in low- and middle-income countries (LMICs)?

Materials and Methods. This systematic review followed PRISMA guidelines. A comprehensive search of PubMed, ScienceDirect, Scopus, ProQuest, Web of Science, and Google Scholar identified 204 records published between January 2000 and July 2025 on CBR after earthquakes. After removing duplicates, screening titles and abstracts, and conducting full-text assessments based on predefined inclusion and exclusion criteria, we included nine studies in the final synthesis. We analyzed data using qualitative content analysis and appraised study quality with CASP for qualitative studies, STROBE-adapted items for observational designs, and the JBI checklist for quasi-experimental studies.

Results. Qualitative content analysis identified 11 major themes and 41 subthemes, encompassing functional and pain-related outcomes, psychosocial and social reintegration, locally adapted and resource-sensitive interventions, and implementation barriers and health-system constraints. Evidence for intervention effectiveness was limited by small samples, lack of control groups, heterogeneous designs, and reliance on descriptive reports. Post-traumatic stress disorder (PTSD) symptoms declined over time in one longitudinal cohort, but intervention-specific effects on PTSD could not be established.

Conclusion. Across the nine included studies, the most consistent signals concerned improved access to rehabilitation and within-group or longitudinal changes in pain, disability, mobility, and activities of daily living. However, the evidence for comparative intervention effectiveness was limited, particularly because some studies used small samples, lacked control groups, or were descriptive service reports. Evidence for psychosocial recovery and social reintegration was promising but inconsistently measured, and PTSD symptoms declined over time in one cohort without establishing an intervention-specific effect.

Keywords. Community-Based Rehabilitation; Earthquakes; Disaster Response; Rehabilitation; Physical Therapy Modalities; Low-and Middle-Income Countries

Introduction

Disasters represent serious and complex challenges to public health systems and communities worldwide (1, 2). According to the World Health Organization (WHO), a disaster is defined as “a serious disruption of the functioning of a community or society causing widespread human, material, economic or environmental losses that exceed the ability of the affected community to cope using its resources” (3). Among natural disasters, earthquakes are particularly destructive due to their sudden onset and the magnitude of human and material loss they cause (4, 5). In addition to fatalities, earthquakes often lead to a high incidence of injuries that result in long-term disabilities, including spinal cord injuries, traumatic brain injuries, amputations, fractures, peripheral nerve injuries, and soft tissue damage (1, 6, 7). Beyond their medical consequences, disasters also impose significant economic and social burdens, straining health systems and affecting long-term development (1, 4). While emergency rescue and lifesaving interventions take precedence in the immediate aftermath of disasters, data suggest that the number of injuries vastly outweighs the number of deaths, underscoring the importance of post-disaster rehabilitation services, particularly physiotherapy (8). In disaster situations, rehabilitation goes beyond emergency medical care and includes coordinated community efforts and multidisciplinary approaches to address long-term functional, psychosocial, and social needs of survivors.

Traditionally, disaster response has included rehabilitation physiotherapists focusing on individual physical rehabilitation, and more recently, active rehabilitation planning and comprehensive community-based interventions aligned with public health and disaster response (1, 6). These professionals have contributed significantly to multidisciplinary humanitarian responses in LMICs, where earthquakes are more prevalent and access to specialized rehabilitation services

remains limited. However, CBR is more than the domain of rehabilitation physiotherapists. It involves a community multidisciplinary and multisector team, including occupational therapy, speech therapy, and social work, nursing, community health, and peer support, who work with families and communities to address a range of comprehensive rehabilitation needs (8, 9).

In this context, CBR has emerged as a promising approach. It utilizes local resources, empowers community members, and enhances access to rehabilitation in resource-constrained settings. This model addresses gaps in traditional facility-based care and aligns with the urgent need for equitable, scalable, and sustainable rehabilitation solutions in post-earthquake scenarios (9).

Accordingly, the primary objective of this systematic review was to synthesize the available evidence on the effectiveness of CBR for earthquake survivors. The secondary objectives were to describe the characteristics and delivery models of these interventions, identify barriers and facilitators affecting their implementation, and examine their reported functional, psychosocial, social, and health-system implications.

The growing phenomenon of CBR advocacy in LMICs with recurrent disasters has received little attention in reviews and conceptual frameworks. They tend to focus on CBR for people with disabilities in non-disaster or mixed-hazard contexts, and, when focusing on earthquakes, are virtually non-existent. They, thus, offer little assistance on the design, delivery, and evaluation of CBR in various stages of the earthquake response and recovery, and do not empirically document the various post-earthquake CBR initiatives.

Previous studies of CBR in disaster and post-conflict settings have highlighted the role of community-based and task-shifted rehabilitation in improving service accessibility and, in the

involvement of service users, in this case, persons with disabilities, in resource-scarce environments. However, in earthquake contexts, comprehensive evidence on the CBR framework remains scarce, particularly regarding its design, implementation, and the results of its various components, including the optimal role of interdisciplinary personnel and community members (10). To address this gap, the present review consolidated evidence on intervention outcomes, implementation conditions, and implications for rehabilitation systems in earthquake-affected, particularly low- and middle-income, settings.

Methods

Design

The review question was framed using a PICO structure (Population, Intervention, Comparison, Outcome) to guide the eligibility criteria and data extraction. This systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (11). The electronic search covered studies published from 1 January 2000 to 31 July 2025. The databases used included PubMed, ScienceDirect, Scopus, ProQuest, and Web of Science (WOS), while Google Scholar was used in a complementary manner to identify additional grey literature and conference papers that might not be indexed in the primary databases, acknowledging its limitations for reproducibility and formal indexing. The selection process is detailed in the PRISMA flowchart (Figure 1).

Figure 1.

Search Strategy

To ensure comprehensive and systematic retrieval of relevant literature, we developed a structured search strategy. Across multiple databases, including PubMed, ScienceDirect, Scopus, ProQuest, Web of Science, and Google Scholar. The search process involved the use of both controlled vocabulary, such as MeSH terms, and free-text terms. These keywords were identified based on the main components of the research question, insights from domain experts, and a review of related literature. The main thematic areas guiding the keyword selection included CBR, such as community physiotherapy, home-based therapy, and community health services; physiotherapy and physical rehabilitation, including physical therapy, rehabilitation, and physical therapy modalities; and earthquake-related concepts such as earthquake, seismic event, and disaster victims. These terms and their synonyms were combined according to the indexing requirements of each database in order to optimize the balance between sensitivity and specificity of the search results. (Supplementary 1) Furthermore, to ensure the inclusion of any potentially relevant studies not captured through database searching, the reference lists of the including all Boolean operators and field tags, are provided in Supplementary 1 to enable replication. This comprehensive and multi-step strategy was designed to encompass the broad range of existing evidence on the implementation and outcomes of CBR in the context of post-earthquake rehabilitation.

Eligibility criteria

Studies were eligible if they reported empirical evidence on CBR or CBR-oriented rehabilitation delivered after an earthquake to survivors with injury- or disability-related needs. For this review, CBR was operationally defined as a rehabilitation intervention delivered predominantly in community, home, or primary-care settings, involving community health workers, volunteers,

family members, or local organizations in the provision or continuation of physical, psychosocial, or social rehabilitation beyond hospital-based acute care.

To be eligible as evidence of intervention effectiveness, a study had to evaluate an implemented CBR intervention or programme and report at least one outcome measured among participants. Eligible evaluations included controlled or quasi-experimental studies, prospective or retrospective observational studies with outcome data, and pre-post studies. Studies that only described the deployment of rehabilitation teams, available services, programme activities, coverage, feasibility, or implementation processes without measuring participant outcomes were not considered evidence of effectiveness; they were eligible only for the descriptive synthesis of intervention characteristics, reach, feasibility, barriers, and implementation experiences.

Eligible sources included peer-reviewed journal articles and relevant grey literature. Peer-reviewed articles had to report original empirical research. Grey literature included governmental or non-governmental organization reports, programme evaluations, field reports, and conference abstracts or proceedings, provided that they described an actual post-earthquake CBR or CBR-oriented programme and contained sufficient methodological information-including the setting, population, intervention or service components, data sources, and reported outcomes or implementation findings- to permit critical appraisal and appropriate classification in the synthesis. Peer-review status was therefore not an eligibility requirement, but grey-literature sources were not treated as equivalent to peer-reviewed intervention evaluations.

For synthesis purposes, included sources were classified into two categories: (1) intervention evaluations, which were used to summarize outcome-related evidence; and (2) descriptive or implementation reports, which were used only to summarize service delivery, programme

characteristics, feasibility, coverage, barriers, facilitators, and contextual or health-system implications. Descriptive reports were not used to infer intervention effectiveness and were not presented as evidence of causal effects.

Only studies involving human participants were considered, and the publication timeframe was limited to research published between January 2000 and July 2025. Both qualitative and quantitative methodologies were included to capture the range of evidence concerning intervention outcomes and implementation. Studies published in English and available as full-text articles, reports, or conference proceedings were considered.

Exclusion criteria

Studies were excluded if their full texts were inaccessible, if they did not meet the defined thematic scope, or if they did not provide sufficient information for classification and appraisal. This included review articles, meta-analyses, systematic reviews, and scoping reviews, as well as non-research publications such as editorials, commentaries, and letters to the editor. Studies focusing exclusively on hospital-based acute rehabilitation without a community-based component, interventions delivered after non-earthquake disasters, and reports that merely advocated for CBR or described planned activities without documenting an implemented programme were excluded. Descriptive reports were retained only when they provided verifiable information about an implemented post-earthquake rehabilitation service and were analyzed separately from intervention-effectiveness studies.

Data Extraction and Analysis

After duplicates were removed, two reviewers independently screened the titles and abstracts, and potentially eligible records were retrieved in full text. Full-text articles were then independently assessed by the same two reviewers against the predefined inclusion and exclusion criteria; any disagreements at both screening stages were discussed and resolved by consensus, and a third reviewer was consulted when consensus could not be reached. A standardized data extraction form was developed a priori, piloted on two studies, and refined to ensure consistency and clarity before being applied to all included articles.

We analyzed the data using qualitative content analysis and an inductive approach, allowing themes and categories to emerge naturally from the data. Coding was conducted independently by two reviewers using NVivo qualitative analysis software (12). Discrepancies in study selection and coding were initially described by the two reviewers and settled by agreement. When an agreement could not be reached, a third reviewer was consulted to arbitrate decisions and complete the coding framework. Codes were categorized thematically to reflect the patterns regarding the roles, outcomes, challenges, and advantages of CBR after the earthquake. An inductive qualitative content analysis was used so that findings could be integrated despite the different study designs (qualitative, observational, and quasi-experimental) by looking primarily at concepts and patterns. Initial codes were made by taking a line-by-line approach to the results sections of the different studies. These codes were subsequently grouped iteratively into higher-order categories. The development of higher-order categories was discussed in analytical meetings. Higher-order categories were validated by checking them against the complete dataset and by ensuring that they captured convergent and divergent findings across study types.

Given the heterogeneity of study designs and outcomes, we integrated the quantitative and qualitative findings using a narrative, theme-oriented approach. The summary of quantitative pre- and post-intervention and cohort findings was done descriptively (for example, the direction and magnitude of changes in functional or pain scores), followed by inductive coding done alongside qualitative data within the same thematic framework, following principles of thematic synthesis and content analysis.

Quality Appraisal and Risk of Bias Assessment

We assessed the methodological quality of the included studies using design-appropriate critical appraisal tools. For the qualitative studies, the Critical Appraisal Skills Programme (CASP) checklist was used; for the observational and cross-sectional studies, the Strengthening the Reporting of Observational Studies STROBE checklist (13) was used as a structured reporting and quality framework, along with design-relevant items adapted from the cross-sectional critical appraisal tools (e.g., the Joanna Briggs Institute checklists); and for the quasi-experimental studies, the JBI Critical Appraisal Checklist for Quasi-Experimental Studies was used. This mixed-methods approach provides a more transparent assessment of the methodological and reporting rigor, observational design, and reporting gaps. In the review protocol, a methodological quality cut-off of 60% (e.g., 6/10 in CASP, 13/22 in STROBE-adapted items, or 6/9 in JBI) was established as a pragmatic threshold to exclude studies with excessive methodological shortcomings, while other studies were available for synthesis. This methodology is similar to other public health and rehabilitation systematic reviews (Supplementary 2).

Because the study designs, settings, and outcome measures were highly heterogeneous, we did not conduct a meta-analysis. Accordingly, a narrative synthesis was undertaken, drawing on principles

of thematic synthesis to organize findings into inductively derived themes and subthemes, with particular emphasis on contextual factors influencing the implementation and effectiveness of CBR interventions (14). Generally, studies that did not meet the minimum quality threshold were excluded from the synthesis.

Results

Study characteristics and quality

Of the 204 records initially identified, 37 duplicates were removed, 140 records were excluded after title and abstract screening, and 24 full-text articles were assessed for eligibility; 15 of these were excluded for not meeting the predefined criteria, leaving nine studies in the final review. The nine included studies comprised intervention evaluations, observational and quasi-experimental studies, qualitative studies, programme implementation studies, and descriptive field reports conducted mainly in Nepal, China, Iran, and Pakistan. The interventions included home-based physiotherapy, community volunteer-led follow-up, and integrated CBR units within public health facilities. Studies were interpreted according to their evidentiary role: intervention evaluations contributed to the synthesis of outcome-related findings, whereas descriptive field reports and programme descriptions contributed only to the synthesis of service characteristics, feasibility, reach, barriers, and implementation context. The selection process followed PRISMA guidelines, as illustrated in Figure 1. Due to the methodological diversity and descriptive nature of the included studies, a meta-analysis was not appropriate. Instead, a qualitative content analysis was performed to extract key thematic categories related to CBR interventions in the aftermath of earthquakes.

Table 1.

The analysis yielded a set of interconnected themes that capture both the opportunities and challenges in delivering physiotherapy services within affected communities (Table 2). These themes reflect the clinical impact of community-based approaches, the importance of locally adapted and multidimensional care, and the role of early, culturally sensitive, and volunteer-supported interventions. They also point to significant implementation barriers and suggest policy-level strategies for strengthening rehabilitation systems. Together, the findings provide a comprehensive understanding of how CBR can contribute to post-disaster recovery and resilience.

Themes were derived from line-by-line coding of the results sections of the nine studies by two reviewers, who independently assigned and refined codes before grouping them into higher-order categories during iterative analytical meetings.

Table 2.

1. Clinical effectiveness of CBR interventions

A. Evidence from post-earthquake rehabilitation programmes

Evidence regarding functional and pain-related outcomes was limited and varied in methodological quality. In a small pre-post study from Nepal, Adhikari et al. evaluated a 12-day CBR protocol in 13 earthquake survivors. Disability and pain scores decreased significantly after the intervention, whereas Timed Up and Go (TUG) performance did not change significantly. Because the study had a very small sample, no control group, and only within-group comparisons, these findings should be interpreted as evidence of short-term feasibility and within-group change rather than as robust evidence of comparative intervention effectiveness (15). A separate study from Nepal reported functional disability and pain-related findings among earthquake-affected

participants; however, this study examined psychosocial determinants of impaired functioning among Nepali widows rather than evaluating a rehabilitation intervention. Therefore, it should not be used to substantiate the effectiveness of CBR, and reference 16 has been removed from claims concerning rehabilitation effects (16).

B. Long-term functional and psychological outcomes

The prospective cohort study of Wenchuan earthquake survivors reported changes in functional outcomes over a four-year period among groups receiving rehabilitation at different times. Monthly improvement in the Modified Barthel Index (MBI) relative to the control group was greater in the late-rehabilitation group than in the early-rehabilitation group, whereas early rehabilitation was associated with greater improvement in pain outcomes (17). PTSD symptoms declined over time, but intervention-specific effects on PTSD could not be established. Accordingly, the observed reduction in PTSD symptoms should not be interpreted as evidence that the rehabilitation intervention itself caused improvement in PTSD. The study nevertheless provides useful longitudinal information on functional recovery, pain, and the temporal pattern of psychological symptoms among earthquake survivors (17).

C. Field Physiotherapy Services in Crisis Settings

Following the Kermanshah earthquake in Iran, physiotherapy teams provided care for acute injuries, including ankle sprains, muscle strains, and nerve damage. The field report primarily documented the activities and reach of deployed rehabilitation teams and highlighted perceived improvements in access and functional recovery. Because it did not use a controlled design or provide a robust intervention-effect estimate, these observations should be interpreted as

descriptive evidence of service delivery and feasibility rather than as evidence of comparative effectiveness (18).

D. Necessity of Long-Term, Integrated Rehabilitation

Many survivors experience long-term problems, including muscle weakness, joint contractures, chronic pain, and limitations in activities of daily living. Research from Sichuan, China, stresses the importance of continuous, integrated rehabilitation services months after disasters to address these ongoing needs (18). Zhang et al. also underline that short-term inpatient care is insufficient and advocate for prolonged rehabilitation programs incorporating regular reassessment, sustained physical and psychological support, and family education to prevent secondary complications and improve overall outcomes (19).

2. Locally Sourced Interventions in Resource-Limited Settings

A. Use of Simple and Locally Available Materials

In disaster-affected areas with scarce resources, rehabilitation programs often depend on low-cost, accessible materials. For example, the 2015 Nepal earthquake response employed items like plastic bottles filled with sand or water, wooden sticks, and ropes to facilitate home-based rehabilitation exercises. This approach enhances the feasibility and sustainability of rehabilitation in resource-poor environments (15).

B. Training and Utilization of Local Healthcare Providers and Volunteers

Local community health workers, physicians, physiotherapists, and trained volunteers play a key role in delivering consistent rehabilitation care without heavy reliance on external inputs.

Empowering locals through training strengthens the continuity and responsiveness of services during prolonged crises (20, 21).

C. Integration with Local Infrastructure and Social Networks

Minimal logistical support from NGOs can enable the establishment of rehabilitation units within existing public health centers, maximizing available resources. Moreover, incorporating local social networks such as support groups and community organizations into program design enhances the cultural relevance and effectiveness of rehabilitation interventions in resource-limited settings (15, 21).

3. Multidisciplinary Teamwork and Volunteer Engagement in Post-Disaster Rehabilitation

Effective disaster rehabilitation requires an integrated approach that combines the expertise of diverse professionals and the active participation of local volunteers. This collaborative framework ensures that survivors receive holistic care addressing their physical, psychological, and social needs, which is especially crucial in the chaotic aftermath of disasters (18).

A. The Role of Multidisciplinary Rehabilitation Professionals

A successful rehabilitation response depends heavily on the coordinated efforts of a multidisciplinary team comprising physiotherapists, occupational therapists, audiologists, optometrists, social workers, orthotists, and medical doctors (15). Each professional contributes specialized knowledge to meet the complex needs of disaster survivors. Physicians and surgeons are typically responsible for providing acute care, particularly for injuries such as fractures and spinal trauma that occur in the early hours following a disaster (15, 21). Physiotherapists support patients by restoring mobility, managing pain, and ensuring the proper use of assistive devices.

Occupational therapists help individuals regain their ability to perform daily tasks independently, thereby promoting functional autonomy. Psychologists offer emotional and psychological support to address trauma, grief, and adjustment difficulties, particularly among those with severe physical impairments. Social workers conduct needs assessments, facilitate access to social services, and promote community reintegration. Medical teams trained in interdisciplinary care are essential for the early identification of disability and the referral of patients to appropriate rehabilitation services. This collaborative model fosters a seamless continuum of care that bridges medical management with psychosocial recovery (18).

B. Integration of Local Volunteers in Service Delivery

In addition to professional teams, local volunteers play a pivotal role in expanding the reach and sustainability of rehabilitation services. Often drawn from the affected communities themselves, these volunteers help deliver essential psychosocial assistance and act as cultural liaisons between survivors and healthcare professionals. Their familiarity with local norms and languages facilitates trust-building and enhances communication, which is critical for ensuring that services are accepted and utilized. Moreover, their involvement enables rehabilitation teams to reach marginalized or geographically isolated populations that might otherwise be overlooked. In many instances, the contribution of volunteers has significantly reduced logistical and operational costs, making interventions more feasible and sustainable in resource-constrained settings (15, 19).

C. Outcomes of Collaborative Models

The integration of professional expertise with community-based participation has yielded promising outcomes in disaster rehabilitation. These collaborative models not only improve access

to services but also ensure that care is culturally sensitive and aligned with community values. Such approaches have been shown to enhance patient satisfaction, promote long-term recovery, and strengthen community resilience. By building networks of support that combine institutional capacity with grassroots engagement, these models offer scalable and adaptable solutions for future disaster scenarios (21).

4. Multidimensional Rehabilitation: Addressing Physical, Psychological, and Social Needs

Following disasters, survivors often experience a wide range of physical, emotional, and social challenges. Multidimensional rehabilitation integrates these domains to support comprehensive recovery and sustainable well-being (18).

A. Physical Rehabilitation and Functional Recovery

Physiotherapy and other physical interventions are essential for pain management, mobility restoration, and functional independence. These services contribute not only to physical healing but also to psychological resilience by improving individuals' sense of control and autonomy (17, 18).

B. Psychological Support and Mental Health

Structured psychological interventions, including individual and group counseling, psychoeducation, and peer support, help address trauma-related conditions such as anxiety and PTSD. Female Community Health Volunteers and community groups play a vital role in delivering continuous psychosocial care, which improves self-esteem and emotional stability (19, 21).

C. Social Reintegration and Community Participation

Social rehabilitation facilitates the rebuilding of social ties, supports vocational and educational reintegration, and fosters a sense of belonging. Activities such as peer networks, group sessions, life skills training, and community events empower survivors to re-engage in community life with confidence (15, 20, 22).

5. Early and Sustained Rehabilitation as a Pillar of Post-Disaster Recovery

Timely initiation and sustained rehabilitation are important for improving survivors' functional, psychological, and social outcomes in crisis settings. Evidence from multiple post-disaster contexts underscores the significance of not only acting early but also ensuring consistent service delivery over time (17).

A. Early Intervention within the First Week

Implementing CBR within the first week post-disaster can significantly reduce secondary complications, improve mobility, and mitigate psychological distress. This timely response lays the groundwork for faster recovery and reintegration into daily life (17, 18).

B. Long-Term Continuity of Care

Sustained rehabilitation over months or even years is essential to achieving durable improvements. Survivors receiving continuous care show better long-term physical outcomes and higher levels of independence. Consistent interventions help prevent complications such as muscle atrophy or pressure ulcers, particularly in individuals with limited mobility (19, 23).

C. Community-Based Workforce Development

Training local healthcare workers and volunteers ensures continuity beyond the duration of external projects or research studies. These personnel serve as a bridge between professional rehabilitation teams and the community, enabling ongoing service delivery and localized support (18, 24).

D. Social Reintegration through Community Support Networks

Community-level support networks comprising families, local organizations, and peers enhance survivors' social and occupational reintegration. These networks offer emotional support, facilitate adherence to rehabilitation routines, and contribute to survivors' overall empowerment (21, 24).

6. Contextualized Rehabilitation with Community Participation

Embedding rehabilitation strategies within local cultural and environmental contexts is essential for meaningful engagement, especially in post-disaster settings. Evidence shows that culturally-tailored and community-anchored rehabilitation improves relevance, accessibility, and long-term impact (17, 24).

A. Cultural and Environmental Relevance

Delivering rehabilitation within individuals' home environments and tailoring interventions to local customs, languages, and daily life increases both feasibility and acceptance. Personalized approaches such as context-specific exercises and flexible routines empower patients and families to engage actively in their recovery (24).

B. Role of Local Volunteers and Family Involvement

Trained local volunteers who are culturally embedded and trusted by the community play a vital role in facilitating service access and bridging gaps between formal services and the community. Their work is particularly impactful among underserved and illiterate populations. Family engagement further enhances motivation, adherence, and long-term functionality (18, 20).

C. Intersectoral and Institutional Collaboration

The effectiveness of contextualized rehabilitation is amplified when local health centers, academic institutions, and government agencies collaborate to build inclusive frameworks. These alliances are critical in developing scalable, community-centered rehabilitation systems that can respond rapidly in disaster contexts (18, 20).

7. Post-Earthquake Rehabilitation Activities

Following an earthquake, CBR extends beyond therapeutic interventions, encompassing holistic strategies aimed at restoring physical functionality, psychosocial well-being, and social reintegration. These multifaceted efforts engage families, communities, healthcare systems, and local resources to ensure sustainable recovery (15, 17, 23, 24). Key rehabilitation activities can be summarized as follows:

A. Physical and Functional Rehabilitation

Post-earthquake physical rehabilitation includes a variety of exercises tailored to the survivor's condition and stage of recovery. These include joint mobilization, stretching, pain management, balance and mobility training, and daily activity practice (e.g., walking, shopping, and farm work).

Specific protocols were used for spinal cord and neurological injuries (e.g., sensory-motor retraining, spasticity management), thoracic injuries (e.g., respiratory exercises), and cardiovascular endurance. Local health staff and family caregivers were trained to assist with in-home practice and long-term follow-up (17, 19, 24).

B. Psychosocial and Peer-Support Interventions

Psychological support was a core component of CBR. Services such as individual counseling, group therapy, peer-support networks, and stress management training helped reduce PTSD, anxiety, and depression. Survivors benefited from emotional connections through shared experiences, which enhanced their resilience, self-esteem, and sense of belonging. Trained community volunteers (e.g., Female Community Health Volunteers) played key roles in identifying vulnerable individuals and facilitating access to mental health services (22, 23).

C. Social and Vocational Reintegration

Social rehabilitation aimed to reconnect individuals with their communities and promote active participation in daily life. Activities included vocational rehabilitation, job training, income-generation programs, and organizing cultural or recreational events. Survivors were assisted in returning to work or starting new occupations. Access to social services such as housing and education was also supported, enabling survivors to regain autonomy and dignity (22, 23).

D. Preventive Education and Assistive Support

Rehabilitation efforts also emphasized injury prevention and self-care education. Caregivers were trained to prevent complications such as pressure ulcers through patient repositioning and use of

pressure-relieving mattresses. Survivors and their families were educated on hygiene, water purification, emergency preparedness, and future risk mitigation. Assistive devices (e.g., crutches, wheelchairs) were provided to improve mobility and independence. Individualized care plans were designed for people with long-term or complex needs (e.g., spinal cord injury) (23).

8: The Critical Role of Local Volunteers in Rehabilitation Resilience

Community-based health volunteers and local personnel are indispensable assets in maintaining and restoring rehabilitation services during and after disasters. Their involvement significantly enhances community resilience and contributes to both immediate response and long-term recovery (18, 20).

A. Frontline Response in Disrupted Systems

In crisis-affected settings like Nepal and Iran, where health systems were either overwhelmed or non-functional, community health volunteers delivered basic rehabilitation care, psychosocial support, and health education. Despite their limited formal clinical training, they filled essential gaps in service delivery, especially during the early response phase (20, 24).

B. Enhancing Access and Cultural Acceptance

Volunteers played a major role in shifting care from hospitals to home- and community-based settings. Their familiarity with local language, customs, and cultural practices enabled them to build trust, improve patient compliance, and facilitate culturally-appropriate rehabilitation strategies (18).

C. Functional Roles in Rehabilitation Delivery

During disasters like the Kermanshah and Sichuan earthquakes, volunteers were engaged in a wide range of rehabilitation services, including physiotherapy, occupational therapy, family education, pressure ulcer prevention, and psychosocial support. Their adaptability and localized knowledge made them effective in responding to specific community needs (17, 19).

D. Strengthening Community Resilience and Social Capital

By collaborating with NGOs and formal health systems, volunteers not only alleviated pressure on professionals but also contributed to rebuilding community networks. Their presence improved community cohesion, psychological recovery, and overall rehabilitation outcomes, particularly in rural and underserved areas (21, 23).

9: Barriers to Effective Implementation of Rehabilitation in Humanitarian Crises

In humanitarian crises, implementing CBR presents challenges that can limit the effectiveness, continuity, and accessibility of services for survivors. Despite the dedicated efforts of community volunteers and local health workers, structural, educational, cultural, and managerial barriers often undermine the success of rehabilitation interventions. Evidence from disasters across various countries underscores the importance of understanding these barriers to design more effective, context-sensitive responses (22, 23).

A. Lack of Resources and Damaged Health Infrastructure

In disaster-affected areas, particularly rural settings, health infrastructure was either severely damaged or insufficient. A critical shortage of rehabilitation equipment, medical supplies,

medications, and specialized services significantly limited access to care and placed a heavy burden on volunteers and local responders (18, 19).

B. Lack of Specialized Training and Standardized Protocols

Many community volunteers and even formal health workers lacked structured training in disaster response, rehabilitation assessments, spinal cord injury care, and pressure ulcer prevention. Their performance was largely based on intuition or experience, which led to inconsistencies and reduced the overall quality of services (20, 24).

C. Psychological Burden and Workforce Fatigue

High workloads, lack of psychological support, unclear roles, and the absence of financial or professional incentives led to exhaustion and burnout among responders. This significantly reduced motivation and negatively affected the efficiency of response teams (17).

D. Cultural, Social, and Economic Barriers

In some communities, rehabilitation interventions were met with cultural resistance, such as reluctance to use assistive devices or participate in therapy. Low awareness, economic hardship, and lack of family involvement, especially in underserved areas, were major obstacles to the success of rehabilitation programs (19).

E. Institutional Fragmentation and Poor Coordination

Fragmented coordination among governmental, humanitarian, and non-governmental actors was identified in the reviewed literature as a potential barrier to continuity and efficiency of post-

earthquake rehabilitation. However, the included studies provided limited empirical detail regarding the effects of inter-organizational fragmentation on resource use, referral delays, or service quality

10. Policy and System Strategies for CBR in Crises

Effective CBR in disaster contexts demands not only clinical readiness but also robust policy support, structural integration, and coordinated action at the national and local levels. Drawing from global evidence, the following strategic recommendations are proposed:

A. Mainstreaming CBR into National Health Systems

Integrating CBR into existing health policies and infrastructures, particularly in rural and underserved areas, is crucial for improving long-term access to services. Establishing permanent rehabilitation units within primary and secondary healthcare facilities has shown promising results (15, 17).

B. Training & Incentives for Community Volunteers

Developing national programs for the regular and structured training, supervision, and incentivization of community health volunteers is vital. These programs should include modules on disaster preparedness, psychosocial support, and home-based care, thus improving quality and retention (18, 20).

C. Emergency Preparedness and Evidence-Based Protocols

Universities and rehabilitation centers should establish emergency contact units and deploy rapid response teams. The creation of risk maps, disaster guidelines, and standardized care protocols for pre-, during, and post-disaster phases enhances responsiveness and coordination (18).

D. Strengthening Local Workforce and Infrastructure

To overcome the shortage of specialists, localized training programs for rehabilitation professionals should be implemented. Investments in rehabilitation infrastructure, especially in remote and disaster-prone regions, are necessary to ensure continuity and accessibility of care (17, 23).

E. Community Engagement and Cross-Sector Collaboration

Encouraging the participation of families and local communities in rehabilitation processes, through education and psychosocial support, enhances trust and effectiveness. Establishing partnerships among governmental bodies, NGOs, and local stakeholders facilitates coordinated service delivery (15, 21).

11. Integrating Hospital-Based and CBR

Although hospital-based rehabilitation plays a vital role in the acute phase of disaster response, it is not sufficient to address the long-term and multifaceted needs of survivors. Integrating hospital services with CBR offers a more comprehensive and sustainable approach, especially in resource-limited and rural settings (15, 17).

A. Complementary roles of hospital and community-based services

Hospital-based services are crucial for immediate post-injury care. However, CBR extends the continuum of care into patients' living environments, where rehabilitation can be adapted to local contexts and support structures. CBR utilizes community resources, engages families, and fosters functional independence through home-based interventions and social reintegration (19).

B. Improved Outcomes through integrated models

Studies from Nepal, China, and Pakistan described hybrid models combining hospital services with community-based follow-up, family education, volunteer support, or other rehabilitation components. These studies reported improvements in quality of life, autonomy, access, or prevention of secondary complications; however, because the interventions were bundled, the findings indicate the potential value of CBR but should not be interpreted as definitive evidence of causal effectiveness (15, 19).

C. The Role of NGOs and Local Partnerships

Involving NGOs, community leaders, and grassroots groups is essential to implement and sustain integrated rehabilitation programs. Their participation facilitates education, prevention, psychosocial support, and outreach, particularly in underserved areas with limited access to specialized services. Effective coordination between institutions and communities strengthens rehabilitation systems and fosters resilience in post-disaster recovery (15, 23).

Discussion

In this systematic review of nine studies on CBR after earthquakes, however, these findings are based on a small number of heterogeneous studies with predominantly observational and pre-post designs and limited follow-up, which restricts the strength of causal inferences that can be drawn about the effectiveness of CBR after earthquakes.

Qualitative and mixed-methods studies additionally highlighted perceived benefits for psychosocial well-being, social participation, and community reintegration, although standardized mental health outcomes were reported less consistently. Several studies also described the feasibility of delivering low-cost, locally sourced interventions through primary health facilities and community volunteers in low-resource, post-earthquake settings. The included studies suggest that post-earthquake rehabilitation programmes incorporating community-based components may be associated with short-term improvements in mobility, pain, and independence; however, the independent contribution of CBR cannot be determined reliably because several studies evaluated bundled hospital–community or multidisciplinary programmes, while others used small samples, uncontrolled designs, or descriptive methods. Long-term functional and psychosocial outcomes were reported less consistently.

This systematic review of CBR interventions in post-earthquake contexts synthesizes evidence from eight studies conducted in varied disaster-prone regions. The findings confirm that CBR, when implemented early and sustained over time, can significantly enhance functional mobility, pain management, mental health, and community reintegration among earthquake survivors. Interventions based on local resources and implemented through community volunteers were

found to be effective in improving access and promoting culturally appropriate rehabilitation models, especially in rural or underserved regions.

Three intervention studies from Nepal, China, and Iran (15, 17, 18) provided robust evidence that home-based physiotherapy interventions led to measurable improvements in activities of daily living, reduction in disability, and enhanced emotional well-being. Taken together, the available data point to CBR as a promising, but still under-evaluated, approach that may indicate potential benefit for functional and psychosocial recovery, rather than providing definitive proof that CBR is an effective treatment for earthquake-related disability. These findings are consistent with the broader literature on disaster rehabilitation, which stresses the importance of long-term, community-integrated approaches (10, 19). Importantly, these interventions were not limited to physical outcomes but addressed a wider spectrum of needs, including psychosocial support and social reintegration, aligning with WHO recommendations for multidimensional recovery strategies (10).

The timing of post-earthquake rehabilitation, the level of available resources, and the extent of cultural adaptation appear to shape reported outcomes, although the available studies do not allow these influences to be attributed specifically to the CBR component. Early post-acute services embedded in primary-care facilities, flexible use of local materials, and culturally attuned engagement of volunteers and families were associated with more favorable reported functional or psychosocial findings in some programmes. However, these programmes commonly included several concurrent components, and the observed associations should therefore be interpreted as signals regarding the feasibility and potential of integrated, community-linked rehabilitation rather than as estimates of the independent effect of CBR.

A notable feature of the reviewed programs was the use of locally available materials for low-cost rehabilitation, for instance, sand-filled bottles used as resistance tools, and the active involvement of trained community volunteers. Such adaptations were shown to enhance the sustainability and acceptability of care (15). However, while volunteer-based rehabilitation promotes community ownership, it also introduces variability in service quality due to differences in training and supervision levels. This concern is consistent with broader implementation literature suggesting that variation in volunteer training and supervision may produce inconsistent service quality; however, this evidence is indirect and does not establish that the same effects occurred in the post-earthquake studies included here (25).

The integration of psychosocial components into physiotherapy was another key factor contributing to better outcomes. For example, group-based interventions and family education improved coping skills and reduced anxiety among survivors (20). These findings support the growing recognition of mental health as a core element of disaster rehabilitation (26). Nevertheless, some evidence suggests that psychosocial interventions, while effective in the short term, may require ongoing support to sustain their benefits over time (27).

When compared with existing literature, several points of alignment and divergence emerged. In line with findings from non-earthquake emergencies such as conflicts and floods, early implementation of CBR consistently yielded better recovery outcomes (28). However, unlike high-income country models that often rely on advanced technology and hospital-based rehabilitation, studies in low-resource settings emphasize the practicality and impact of community-first approaches. This divergence reflects differing healthcare infrastructure capacities and underlines the relevance of CBR in settings with limited access to hospitals and specialists (29).

Beyond earthquakes, systematic reviews of rehabilitation and community-based interventions in other disasters and conflicts report similar themes, including delayed or fragmented access to rehabilitation, heavy reliance on community workforce, and the importance of integrating physical and psychosocial components of care. Our findings align with this broader literature by highlighting that early, locally delivered rehabilitation can support functional recovery and mental health, but damaged infrastructure, workforce shortages, and weak coordination often constrain it. A key difference in post-earthquake contexts is the high burden of musculoskeletal and spinal injuries, which places particular emphasis on task-shifted physiotherapy and community follow-up to prevent long-term disability, where CBR remains marginal. Although trauma care systems are well established in many countries, CBR lacks the same institutional recognition. As Reinhardt et al. highlight (17), national policies often fail to allocate resources for post-acute community rehabilitation. This underlines the urgent need to formally integrate CBR into national health strategies and disaster risk reduction plans, supported by evidence-based guidelines and sustainable funding mechanisms. Policy-makers and humanitarian agencies could pilot structured CBR models within disaster preparedness plans while embedding robust evaluation components to strengthen the evidence base.

Another area of debate pertains to the balance between hospital-based and community-based care. Integrated models that combine the strengths of both approaches are increasingly advocated (10, 19). In highly unstable or acute crisis settings, hospital-based rehabilitation may remain necessary when community structures and referral pathways are disrupted; however, this is a contextual consideration rather than a comparative finding established by the present review (30). Nevertheless, the majority of included studies suggest that hospital services alone are insufficient

for long-term recovery, and that CBR fills critical gaps by providing continuity of care within survivors' living environments.

Implementation challenges remain significant. Infrastructure damage, equipment shortages, and human resource limitations often constrain the reach and consistency of CBR. Volunteers may lack adequate training in rehabilitation or psychosocial care, which can compromise care quality (15, 18). Furthermore, poor coordination among governmental and non-governmental organizations frequently leads to fragmented efforts and inefficient service delivery (19). These barriers point to the need for stronger coordination mechanisms, standardized care protocols, and pre-disaster training programs that prepare local systems for future crises.

Looking ahead, several practical and research-oriented recommendations emerge. Governments should mandate the inclusion of CBR in national disaster preparedness and recovery frameworks, with dedicated funding and policy support. Structured training programs for community volunteers, such as those modeled after WHO's mhGAP, can help build local capacity in trauma-informed rehabilitation care. Multi-stakeholder partnerships among health systems, NGOs, and academic institutions are also critical to facilitate resource sharing, data collection, and implementation research.

The potential of tele-rehabilitation, especially in remote or disaster-affected regions, has also been highlighted in recent studies. Digital tools can provide remote guidance and follow-up, mitigating geographical and logistical barriers (31). Moreover, the economic dimension of CBR warrants further attention. Cost-effectiveness analyses indicate that community-based models can offer substantial savings over institutional care, while maintaining or improving health outcomes (32).

Analytical synthesis of effectiveness and implementation

The reviewed evidence does not support treating CBR as a single uniform intervention. Rather, its effects appear to depend on the interaction between intervention intensity, timing, continuity, workforce capability, and the strength of referral links. The clearest outcome-related signals came from intervention evaluations combining home-based physiotherapy with repeated assessment and follow-up. In contrast, isolated outreach reports, field reports, and descriptive programme descriptions primarily documented feasibility, service coverage, access, and implementation experience; they were not interpreted as evidence of intervention effectiveness. This distinction is important because improved service coverage is not equivalent to improved health outcomes. The evidence also suggests a trade-off: task-shifting and locally available materials improve reach and affordability, but insufficient training, supervision, and standardization may increase variation in care quality. Accordingly, future evaluations should report both outcome effectiveness and implementation performance, including coverage, fidelity, acceptability, equity, continuity, adverse events, and resource use.

Implications for policymakers and readers

For decision-makers, the central implication is not simply to expand CBR, but to build a coordinated rehabilitation pathway that can function during prolonged recovery. Minimum requirements include a named coordinating body, clear referral criteria, competency-based training for community workers, routine supervision by rehabilitation professionals, essential assistive products, protected funding, and a common information system. For readers and practitioners, the review supports using CBR as a flexible platform for reaching survivors, while requiring transparent monitoring and avoiding overgeneralization from small, heterogeneous studies. These

conditions make CBR more likely to produce meaningful and equitable recovery rather than only short-term service activity.

Future research and innovation

However, while none of the post-earthquake CBR studies included in this review assessed specific models and cost-effectiveness of tele-rehabilitation, evidence from rehabilitation research generally has begun to demonstrate that home-based and tele-enabled rehab is feasible and cost-effective for patients across a range of conditions. It would be interesting to investigate in disaster and hard-to-reach areas how such interventions could complement the CBR initiatives where physical access is not available, although this hypothesis can only be inferred in earthquakes. Future research will thus have to investigate the acceptability, effectiveness, and cost-effectiveness of tele-enabled CBR models in post-earthquake settings with sound study designs and context-appropriate intervention frameworks. Economic analyses are also required to make decisions regarding priority-setting and resource allocation for CBR in the context of scarce disaster health budgets, especially where current data on the costs and efficiency of CBR after earthquakes is almost absent (33-35).

Limitation

Although the review yielded promising findings, several limitations should be considered. Most importantly, we found only nine studies that met our inclusion criteria, and substantial diversity in study designs, interventions, and outcomes limited comparability, which made comparisons difficult and also limited any possibility of a quantitative synthesis. Second, the literature search and inclusion were limited to English publications only; this may result in some missing studies published in other languages, with potential language and publication bias. Thirdly, the

methodological quality and sample size in the included studies varied, and many did not have control or comparison groups, which weakens reliance on observed associations between CBR participation and outcomes. Fourth, the outcome measures were not standardized across studies, particularly for psychosocial and social participation outcomes, so it was difficult to assess the size and clinical implications of reported changes. Stronger, longitudinal, and standardized assessments of long-term functional, psychosocial, and economic outcomes across the phases of earthquake recovery in various geographic and cultural contexts are needed to assess CBR programs.

Conclusion

This systematic review indicates that CBR is a feasible and potentially valuable component of post-earthquake recovery, particularly where specialist services and transport are limited. Across the nine included studies, the most consistent signals of benefit concerned short-term reductions in pain and disability, improved mobility and activities of daily living, prevention of secondary complications, and better access to rehabilitation. Evidence for psychosocial recovery and social reintegration was promising but less consistently measured, while the available studies did not establish a reliable long-term effect on mental-health outcomes. Because most studies were observational, pre-post, or quasi-experimental, used small or heterogeneous samples, and often lacked a comparator, these findings should be interpreted as indications of potential benefit rather than definitive evidence of causal effectiveness.

The synthesis also shows that effectiveness depends on implementation conditions. CBR worked best when it began during the post-acute phase, continued through structured follow-up, was linked to primary-care and hospital services, and adapted exercises and assistive support to survivors' homes, culture, and available resources. Local volunteers and family members expanded geographical reach and improved trust, but their contribution cannot substitute for professional

assessment, referral, supervision, and safeguarding. Thus, the most defensible model is a tiered and integrated pathway: hospitals and rehabilitation specialists provide assessment and complex care; primary-care teams coordinate follow-up; and trained, supervised community workers support home-based exercises, prevention, psychosocial first-line support, and referral.

The principal implementation challenges are damaged infrastructure, shortages of equipment and specialists, inadequate training and supervision, volunteer fatigue, weak referral and data systems, fragmented coordination among government and humanitarian agencies, and social or economic barriers to participation. These barriers explain why apparently low-cost interventions may not be sustainable without policy and financing support. For policymakers, the priority should therefore be to incorporate CBR into national disaster preparedness and recovery plans, designate rehabilitation coordination mechanisms, establish minimum training and supervision standards for community workers, maintain referral links between hospitals and communities, and fund essential assistive products and long-term follow-up. Programs should also report outcomes using standardized measures of function, pain, participation, mental health, equity, coverage, continuity, and cost.

Future studies should use prospective, controlled, and longitudinal designs where feasible, and should distinguish the effects of individual intervention components; distinguish intervention components and timing; include underserved groups; and evaluate implementation fidelity, acceptability, equity, and cost-effectiveness. Until such evidence is available, CBR should be implemented as a context-adapted, monitored, and integrated service, not as a universally proven standalone treatment. This approach preserves the practical value of community delivery while avoiding claims that exceed the current evidence base.

Abbreviations

CASP: Critical Appraisal Skills Program

CBR: Community-Based Rehabilitation

JB: Joanna Briggs Institute

LMICs: Low- and Middle-Income Countries

MBI: Modified Barthel Index

MeSH: Medical Subject Headings

NGOs: Non-governmental Organizations

PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses

PTSD: Post-traumatic Stress Disorder

STROBE: Strengthening the Reporting of Observational Studies in Epidemiology

TUG: Timed Up and Go

WHO: World Health Organization

WOS: Web of Science

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Author contribution

RAS and MH designed the study. RAS, MH, PD, and AK collected data. RAS and MH analyzed data. All authors contributed to the analysis and interpretation of data. RAS and MH drafted and revised the article in response to the other authors' comments. All authors approved the final version.

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Declarations

Ethics approval and consent to participate

The present study was approved by the Ethical Committee of the Medical Sciences University of Shahrekord (Ethics code: IR.SKUMS.REC.1404.012).

Conflict of interest

The authors declared no conflict of interest.

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Table 1. The characteristics of the included studies

No.	Author (Year/Country)	Aim	Study Type / Sample	Methods	Key Findings
1	Reinhardt et al. (2022, China)	Assess long-term rehab outcomes post-earthquake	Prospective cohort / 591	MBI, VAS, PTSD Checklist; 3 time points; mixed-effects regression	Functional improvement occurred over time in all groups. Compared with the control group, the late-rehabilitation group showed greater monthly improvement in the Modified Barthel Index than the early- rehabilitation group, whereas early rehabilitation showed superior improvement in pain. PTSD symptoms declined over time, but intervention-specific effects on PTSD could not be established.
2	Adhikari et al. (2018, Nepal)	Develop and test a CBR protocol post-earthquake	Pre-post experimental / 13	12-day home-based rehab; WHODAS, pain scale, TUG; Wilcoxon test	Disability and pain scores decreased significantly after a 12-day community-based rehabilitation protocol, but TUG did not change significantly. The absence of a control group and the very small sample limit conclusions to short-term feasibility and within-group change rather than comparative effectiveness.

3	Heidari et al. (2024, Iran)	Describe post-earthquake multidisciplinary rehab field experience	Field report / N.A.	Narrative description of deployed teams and services	Improved access and functional recovery; highlighted the need for structured disaster rehabilitation systems.
4	Bhattarai et al. (2022, Nepal)	Explore FCHVs' roles and challenges during earthquake response	Qualitative / 28	In-depth interviews; thematic analysis	Female Community Health Volunteers were vital responders; faced training and supply gaps; community trust was high.
5	Mareschal et al. (2017, Nepal)	Implement and assess sustainable public rehab units	Program implementation / 4,617	Public facility records, outreach data, and service statistics	24% had earthquake-related injuries; majority musculoskeletal and fractures; 68% outreach coverage; women benefited more
6	Zhang et al. (2013, China)	Evaluate NHV program's long-term effects	Quasi-experimental / 510	Barthel Index; Tobit regression; 3 groups (early, late, control)	Both intervention groups improved significantly vs control; Neighborhood Health Volunteer-Early slightly better than Neighborhood Health Volunteer-Late.
7	Chishtie et al. (2019, Pakistan)	Evaluate CBR program for SCI pressure ulcer prevention	Cross-sectional case study / 33	Interviews; medical record review	82% ulcer-free at 1-year; high knowledge retention; spinal cord injury patients underserved post-disaster.
8	Chung et al. (2016, China)	Assess outcomes of a CBR-integrated rehab program	Qualitative case study	Interviews, FGDs, document analysis	Improved function and partial empowerment; limited community ownership; hybrid rehab model suggested.
9	Adhikari et al. (2018, Nepal)	Evaluate a 2-week community-based physiotherapy intervention for chronic MSK pain and disability	Interventional / 57	Physiotherapy sessions for 2 weeks; pre/post assessment; VAS and disability scores	Significant improvement in pain and disability; suggested potential for scalability in disaster-affected communities.

Table 2. Themes, sub-themes, and key codes extracted from included studies on community-based physiotherapy after earthquakes

Main theme	Subtheme	Key points / Indicators
1. Clinical Effectiveness of Community-Based Physiotherapy Interventions	<i>A. Evidence from Post-Earthquake Rehabilitation Programs</i>	Clinical improvements, increased access, Nepal earthquake programs
	<i>B. Long-Term Functional and Psychological Improvements</i>	Long-term recovery, quality of life, reduction of anxiety, and PTSD
	<i>C. Field Physiotherapy Services in Crisis Settings</i>	Field physiotherapy, acute injury care
	<i>D. Necessity of Long-Term, Integrated Rehabilitation</i>	Need for sustained and integrated care, prevention of secondary complications
2. Locally Sourced Interventions in Resource-Limited Settings	<i>A. Use of Simple and Locally Available Materials</i>	Use of simple, locally accessible materials, recycling local resources
	<i>B. Training and Utilization of Local Healthcare Providers and Volunteers</i>	Training and engaging local human resources to enhance sustainability
	<i>C. Integration with Local Infrastructure and Social Networks</i>	Integration with local infrastructure and social networks
3. Multidisciplinary Teamwork and Volunteer Engagement in Post-Disaster Rehabilitation	<i>A. The Role of Multidisciplinary Rehabilitation Professionals</i>	Role of different medical and rehabilitation specialists in holistic care
	<i>B. Integration of Local Volunteers in Service Delivery</i>	Engagement of local volunteers to enhance cultural connection and access
	<i>C. Outcomes of Collaborative Models</i>	Patient satisfaction, long-term recovery, community resilience

4. Multidimensional Rehabilitation: Addressing Physical, Psychological, and Social Needs	<i>A. Physical Rehabilitation and Functional Recovery</i>	Physical therapy, functional recovery, improved independence
	<i>B. Psychological Support and Mental Health</i>	Psychological support, PTSD treatment, role of local groups
	<i>C. Social Reintegration and Community Participation</i>	Social reintegration, life skills training, empowerment
5. Early and Sustained Rehabilitation as a Pillar of Post-Disaster Recovery	<i>A. Early Intervention within the First Week</i>	Early response, reducing complications, faster recovery
	<i>B. Long-Term Continuity of Care</i>	Ongoing care, preventing chronic complications, maintaining independence
	<i>C. Community-Based Workforce Development</i>	Training local workforce and volunteers for service continuity
	<i>D. Social Reintegration through Community Support Networks</i>	Role of community support networks in social reintegration
6. Contextualized Rehabilitation with Community Participation	<i>A. Cultural and Environmental Relevance</i>	Adapting rehabilitation to culture and living environment, tailored exercises
	<i>B. Role of Local Volunteers and Family Involvement</i>	Local volunteers' role and family participation to improve motivation and adherence
	<i>C. Intersectoral and Institutional Collaboration</i>	Cross-sector and institutional partnerships for scalable community-based systems

7. Post-Earthquake Rehabilitation Activities	<i>A. Physical and Functional Rehabilitation</i>	Specialized physical exercises, pain management, caregiver training
	<i>B. Psychosocial and Peer-Support Interventions</i>	Psychological support, peer networks, anxiety and PTSD reduction
	<i>C. Social and Vocational Reintegration</i>	Social and vocational rehabilitation, job training, return to work support
	<i>D. Preventive Education and Assistive Support</i>	Prevention education, assistive devices, self-care training
8. The Critical Role of Local Volunteers in Rehabilitation Resilience	<i>A. Frontline Response in Disrupted Systems</i>	Volunteers' role in overwhelmed or collapsed health systems
	<i>B. Enhancing Access and Cultural Acceptance</i>	Facilitating access, culturally appropriate care, building trust
	<i>C. Functional Roles in Rehabilitation Delivery</i>	Involvement in physiotherapy, family education, psychosocial support
	<i>D. Strengthening Community Resilience and Social Capital</i>	Building social capital and community resilience
9. Barriers to Effective Implementation of Rehabilitation in Humanitarian Crises	<i>A. Lack of Resources and Damaged Health Infrastructure</i>	Equipment shortages, damaged infrastructure, limited care access
	<i>B. Lack of Specialized Training and Standardized Protocols</i>	Insufficient training, absence of standardized protocols
	<i>C. Psychological Burden and Workforce Fatigue</i>	Mental exhaustion, lack of motivation and support

	<i>D. Cultural, Social, and Economic Barriers</i>	Cultural resistance, economic hardship, family disengagement
	<i>E. Institutional Fragmentation and Poor Coordination</i>	Lack of coordination among NGOs and agencies
10. Policy and System Strategies for CBR in Crises	<i>A. Mainstreaming CBR into National Health Systems</i>	Integrating rehabilitation into national health policies and permanent units
	<i>B. Training & Incentives for Community Volunteers</i>	Regular training, supervision, and incentives for volunteers
	<i>C. Emergency Preparedness and Evidence-Based Protocols</i>	Developing standardized protocols and emergency plans
	<i>D. Strengthening Local Workforce and Infrastructure</i>	Investing in local workforce development and rehab infrastructure
	<i>E. Community Engagement and Cross-Sector Collaboration</i>	Family involvement, multi-sector partnerships, coordinated delivery
11. Integrating Hospital-Based and CBR	<i>A. Complementary roles of hospital and community services</i>	Hospital care for acute phase, CBR for long-term recovery and adaptation
	<i>B. Improved Outcomes through integrated models</i>	Combined hospital and community rehab improves quality of life and autonomy
	<i>C. The Role of NGOs and Local Partnerships</i>	NGOs and local groups enhance education, prevention, and outreach