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Clinical Research on Traditional Chinese Medicine in the Balkans: A Mapping Study of Registered Clinical Trials

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Abstract

Traditional Chinese Medicine (TCM) encompasses a broad range of therapeutic approaches, including acupuncture, electroacupuncture, herbal medicine, moxibustion, cupping, and other traditional interventions. Although TCM has gained increasing attention in clinical research worldwide, its investigation and integration within European healthcare systems remain heterogeneous. In the Balkan region, the extent and characteristics of clinical research involving TCM have not been systematically mapped. This study aimed to characterize registered clinical trials investigating TCM interventions conducted in Balkan countries and to describe their geographical distribution, therapeutic modalities, clinical indications, and methodological characteristics. ClinicalTrials.gov and the World Health Organization International Clinical Trials Registry Platform (WHO ICTRP) were systematically searched for eligible interventional studies. Eleven trials met the predefined eligibility criteria. Research activity was concentrated in Greece (n=5; 45.5%), Slovenia (n=3; 27.3%), and Croatia (n=2; 18.2%), while one multinational trial included a study site in Romania (n=1; 9.1%). Acupuncture and related techniques, including electroacupuncture, auricular acupuncture, and laser acupuncture, represented the predominant TCM interventions. Clinical indications were heterogeneous but focused mainly on pain and musculoskeletal conditions, migraine, and perioperative symptom management. Registered TCM clinical research in the Balkans therefore appears limited, geographically concentrated, and predominantly focused on acupuncture. Mapping this research landscape highlights geographical and therapeutic gaps and may help identify opportunities for broader clinical investigation of TCM interventions within the region.

Keywords: Traditional Chinese Medicine; acupuncture; clinical trials; Balkans; complementary medicine

Introduction

Traditional Chinese Medicine (TCM) represents a broad system of traditional medical practices that has been used for centuries and continues to play an important role in

healthcare, particularly in East Asia. It encompasses a variety of therapeutic approaches, including acupuncture, herbal medicine, moxibustion, cupping, and related techniques. Over recent decades, interest in these interventions has expanded internationally, accompanied by increasing clinical research evaluating their potential effectiveness, safety, and role as complementary approaches to conventional medical care [1].

Within Europe, the use and investigation of TCM interventions vary considerably between countries. Acupuncture is among the most widely recognized and studied modalities, while other components of TCM, particularly Chinese herbal medicine, remain less consistently integrated into clinical practice and research. Differences in healthcare systems, regulatory frameworks, professional recognition, and research infrastructure may contribute to substantial variation in the extent to which TCM is investigated across European countries.

The Balkan region represents a particularly relevant setting in this context. The region includes countries with diverse healthcare systems, research capacities, regulatory environments, and historical approaches to complementary and traditional medicine. Despite the broader international growth of research involving TCM, the extent to which these interventions have been investigated through registered clinical trials in Balkan countries remains unclear. Individual studies are available, but the geographical distribution, therapeutic areas, types of TCM interventions, and methodological characteristics of this research have not been comprehensively described.

Clinical trial registries provide an important source of information for examining such research activity. In addition to identifying completed studies, registries can capture ongoing, unpublished, or discontinued trials and may therefore provide a broader representation of the clinical research landscape than published literature alone. International initiatives promoting prospective clinical trial registration have further strengthened the role of registries in improving transparency and reducing selective reporting in clinical research [2].

Therefore, the present study aimed to systematically map registered interventional clinical trials investigating TCM interventions conducted in the Balkan region. Specifically, it sought to describe their geographical distribution, investigated TCM modalities, clinical indications, study designs, recruitment characteristics, and other relevant methodological features.

Literature Review

Traditional Chinese Medicine has increasingly become the subject of clinical research outside its traditional geographical setting. Among its various therapeutic modalities, acupuncture has received substantial international research attention, while Chinese herbal medicine, moxibustion, cupping, and related practices have also been evaluated across a variety of clinical conditions. Previous registry-based research has demonstrated considerable clinical research activity in TCM, with interventional studies and randomized parallel-group designs representing a substantial proportion of completed registered trials [3]. This growing body of registered research reflects broader scientific interest in evaluating traditional and complementary medical interventions using contemporary clinical research methodologies.

Within Europe, complementary and traditional medicine occupies a heterogeneous position. The availability, regulation, professional recognition, and integration of these approaches differ substantially between countries. Acupuncture is comparatively well established in several European healthcare environments and has been investigated for conditions including chronic and musculoskeletal pain, neurological disorders, and symptom management. Other TCM modalities, particularly Chinese herbal medicine, appear to have a more limited and variable presence in European clinical research. Previous European research has also demonstrated substantial differences between countries in the utilization and organization of complementary and alternative medicine [4].

The situation in the Balkan region is less clearly characterized. The region consists of countries with differing healthcare systems, research infrastructures, regulatory frameworks, and traditions regarding complementary medicine. These differences can

be illustrated by North Macedonia, where complementary and alternative medicine is addressed within a national regulatory framework and where cooperation and activities related to TCM have developed over time [5]. However, the existence of regulatory frameworks or clinical use of complementary medicine does not necessarily correspond to substantial registered clinical research activity. While individual studies involving acupuncture and other TCM-related interventions have been conducted in Balkan countries, the overall regional research landscape remains difficult to assess from published studies alone.

Reliance exclusively on published literature may also provide an incomplete representation of research activity. Clinical trial registries can identify ongoing and completed studies regardless of whether their results subsequently appear in peer-reviewed publications. Registry-based analyses can therefore provide valuable information on study design, enrollment, interventions, recruitment status, geographical distribution, and broader patterns in clinical research [6].

Despite growing international interest in TCM, consolidated information describing registered clinical trials of TCM interventions specifically within the Balkan region remains limited. Systematic mapping of trial registries may therefore provide a clearer understanding of where such research has been conducted, which therapeutic modalities and clinical conditions have been investigated, and which geographical or therapeutic areas remain underrepresented.

Materials and Methods

Study Design

This study was designed as a descriptive mapping study of registered interventional clinical trials investigating TCM interventions conducted in the Balkan region. The analysis was based exclusively on publicly available clinical trial registry information and did not involve individual participant-level data.

Data Sources and Search Strategy

ClinicalTrials.gov and the World Health Organization International Clinical Trials Registry Platform (WHO ICTRP) were systematically searched to identify potentially eligible studies. WHO ICTRP was used as a complementary source because it provides access to records supplied by multiple international and national clinical trial registries [2].

Searches were performed using terms related to TCM and its major therapeutic modalities, including “Traditional Chinese Medicine,” “Chinese medicine,” “acupuncture,” “electroacupuncture,” “auricular acupuncture,” “Chinese herbal medicine,” “moxibustion,” and “cupping.” Search terms were combined with individual Balkan country names to identify trials conducted within the geographical region of interest.

For the purposes of this study, the Balkan region included Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Greece, Kosovo, Montenegro, North Macedonia, Romania, Serbia, and Slovenia. Turkey was considered separately because only part of its territory is geographically located within the Balkan Peninsula and was not included in the principal regional analysis.

Eligibility Criteria and Study Selection

Studies were eligible if they: (1) were registered as interventional clinical studies; (2) investigated at least one TCM-related therapeutic intervention; and (3) included at least one study site located in one of the predefined Balkan countries.

Studies were eligible irrespective of recruitment or publication status. Observational studies, studies without a TCM-related therapeutic intervention, and trials without an eligible Balkan recruitment site were excluded. Records referring to the same clinical trial across multiple registries were treated as duplicates and consolidated as a single study.

Potentially relevant records were reviewed according to study type, intervention, and geographical location. Following eligibility assessment and removal of ineligible or duplicate records, 11 interventional clinical trials met the predefined criteria and were included in the final analysis.

Data Extraction

For each eligible trial, available registry information was systematically extracted. Variables included trial registration number, country of recruitment, registration year, recruitment status, investigated clinical condition, TCM intervention, comparator or control intervention, study design, planned or actual enrollment, allocation method, masking, and primary outcome measures. Where available, information regarding study completion and availability of study results was also recorded.

TCM interventions were categorized according to the principal therapeutic modality, including conventional acupuncture, electroacupuncture, auricular acupuncture, laser acupuncture, Chinese herbal medicine, moxibustion, cupping, and other TCM-related interventions. Where more than one modality was investigated within a study, this was recorded accordingly.

Clinical indications were additionally grouped into broader therapeutic categories where appropriate to facilitate comparison between studies.

Data Analysis

Data were analyzed descriptively. Categorical variables were summarized using frequencies and percentages, while numerical variables were described using the registry-reported values and appropriate descriptive summaries where applicable. Trials were evaluated according to geographical distribution, TCM modality, clinical indication, recruitment status, study design, sample size, and other relevant methodological characteristics.

No meta-analysis of treatment effects was performed because the objective was to map and characterize registered clinical research involving TCM in the Balkan region rather than to determine the clinical efficacy or safety of individual interventions.

Ethical Considerations

The study used exclusively publicly accessible clinical trial registry information and did not involve identifiable participant-level data or direct interaction with human participants. Accordingly, neither ethical approval nor informed consent was required for this study.

Results

Study Selection and Geographical Distribution

The registry search yielded 11 eligible interventional clinical trials examining interventions related to Traditional Chinese Medicine (TCM) in the Balkan region.

The distribution of these studies across the region was not uniform. Greece had the highest number, with five trials (45.5%), followed by Slovenia with three (27.3%) and Croatia with two (18.2%). In addition, one multinational trial reported a study site in Romania, representing 9.1% of the total. Collectively, Greece, Slovenia, and Croatia were the locations of 10 out of the 11 identified trials, corresponding to 90.9% of all eligible studies.

No eligible interventional trials meeting the predefined criteria were identified in Albania, Bosnia and Herzegovina, Bulgaria, Kosovo, Montenegro, North Macedonia, or Serbia.

TCM Modalities

Acupuncture and acupuncture-related techniques represented the predominant therapeutic modality. Identified interventions included conventional acupuncture, electroacupuncture, auricular acupuncture, laser acupuncture, and other acupuncture-based approaches.

In contrast, no comparable registered interventional research involving Chinese herbal medicine, moxibustion, or cupping was identified within the included dataset.

Trials Conducted in Greece

Greece accounted for the largest proportion of eligible studies. The identified trials investigated perioperative electroacupuncture for postoperative analgesia following prostatectomy (NCT01526525), electroacupuncture for carpal tunnel syndrome (NCT04603274), acupuncture for the prevention of postoperative nausea and vomiting following laparoscopic cholecystectomy (NCT04759079), electroacupuncture for fibromyalgia (NCT05357157), and acupuncture as one of the interventions evaluated for chronic neck pain (NCT05870371).

Study populations ranged from relatively small exploratory cohorts to 200 participants in the chronic neck pain study.

Trials Conducted in Croatia

Two eligible trials were identified in Croatia. These investigated auricular acupuncture for pain relief following episiotomy (NCT03534869), involving 60 participants, and acupuncture for symptomatic knee osteoarthritis (NCT05014542), involving 64 participants.

Both trials focused primarily on pain or symptom management.

Trials Conducted in Slovenia

Three eligible interventional studies were identified in Slovenia. These included perioperative acupuncture in a study evaluating postoperative recovery (NCT05068037), comparison of acupuncture with transcranial direct-current stimulation for migraine (NCT06834022), and comparison of traditional acupuncture, electroacupuncture, and laser acupuncture in adults with migraine (NCT07292506).

The latter studies demonstrate particular research interest in acupuncture-based approaches to migraine management.

Trial Including Romania

Romania was represented by an international randomized trial investigating acupuncture for nonspecific low back pain (NCT01049074). The study included research sites in both China and Romania.

The registry-reported enrollment represented the overall multinational study population rather than participants recruited specifically at the Romanian site; therefore, this value was not interpreted as the Romanian participant population.

Clinical and Methodological Characteristics

Across the identified trials, clinical indications were heterogeneous but concentrated predominantly in pain-related and musculoskeletal disorders, migraine, and perioperative symptom management.

Randomized controlled designs were frequently employed, although study designs, masking procedures, comparator groups, and sample sizes varied between trials. Overall, the findings demonstrate substantial geographical concentration of registered TCM research within the Balkan region and a strong predominance of acupuncture-related interventions.

Table 1. Characteristics of Registered Interventional TCM Trials Identified in the Balkan Region

Country	Trial registration	Main clinical condition/application	TCM intervention	Enrollment *
Greece	NCT01526525	Postoperative analgesia following prostatectomy	Electroacupuncture	70
Greece	NCT04603274	Carpal tunnel syndrome	Electroacupuncture	25
Greece	NCT04759079	Postoperative nausea and vomiting	Acupuncture	100
Greece	NCT05357157	Fibromyalgia	Electroacupuncture	80
Greece	NCT05870371	Chronic neck pain	Acupuncture	200
Croatia	NCT03534869	Post-episiotomy pain	Auricular acupuncture	60
Croatia	NCT05014542	Knee osteoarthritis	Acupuncture	64
Slovenia	NCT05068037	Perioperative/postoperative recovery	Acupuncture-based intervention	60
Slovenia	NCT06834022	Migraine	Acupuncture	120
Slovenia	NCT07292506	Migraine	Traditional, electro- and laser acupuncture	75
Romania†	NCT01049074	Nonspecific low back pain	Acupuncture	534

* Enrollment represents the registered actual or planned overall study enrollment, as applicable.

Multinational trial including a Romanian study site; the registry-reported enrollment represents the overall study population and not specifically the number of participants recruited in Romania.

Figure 1. Study Identification and Selection Process
ClinicalTrials.gov and WHO ICTRP were searched using predefined TCM-related terms combined with individual Balkan country names. Potentially relevant records were screened according to study type, intervention, and geographical location. Observational studies, studies without an eligible TCM intervention, trials without an eligible Balkan recruitment site, and duplicate registrations were excluded. Following eligibility assessment, 11 registered interventional clinical trials were included in the final analysis: Greece (n=5), Slovenia (n=3), Croatia (n=2), and Romania (n=1; multinational trial).

Discussion

This mapping study identified 11 registered interventional clinical trials involving TCM-related interventions in the Balkan region, demonstrating a limited and geographically concentrated research landscape. Greece accounted for the largest number of identified trials, followed by Slovenia and Croatia, while Romania was represented by one multinational study. No eligible interventional trials were identified in the remaining countries included in the analysis.

A particularly notable finding was the strong predominance of acupuncture and acupuncture-related techniques. Conventional acupuncture, electroacupuncture, auricular acupuncture, and laser acupuncture were represented, whereas other major components of TCM, including Chinese herbal medicine, moxibustion, and cupping, were not similarly represented among the identified trials. This contrasts with the broader international TCM research landscape, where a wider range of interventions has been investigated in registered clinical trials [3].

The identified studies were concentrated within several therapeutic areas. Pain management, musculoskeletal disorders, migraine, and perioperative symptoms represented the principal clinical applications. This pattern suggests that registered TCM research in the Balkan region has primarily focused on symptom-oriented and non-pharmacological applications of acupuncture rather than on the broader therapeutic spectrum associated with TCM.

The geographical concentration of trials may reflect differences in research infrastructure, regulatory environments, institutional expertise, and academic interest between Balkan countries. Importantly, the absence of registered interventional trials should not necessarily be interpreted as an absence of TCM practice or research. Previous work, for example, has documented a regulatory framework and activities related to complementary medicine and TCM in North Macedonia [5], despite the absence of an eligible registered interventional trial from the country in the present analysis.

Several limitations should be considered. The analysis relied on publicly available registry information, and the completeness and accuracy of individual records depend on information submitted by investigators and sponsors. Registry coverage and update schedules may differ between data providers, and differences in terminology may have affected identification and classification of TCM interventions. Studies using alternative terminology or inadequately indexed interventions may therefore have been missed. In addition, registry information alone does not allow comprehensive assessment of methodological quality, clinical effectiveness, or safety. The relatively small and heterogeneous number of identified trials further limits meaningful comparisons between countries and therapeutic areas.

Despite these limitations, the study provides an overview of a relatively unexplored area of clinical research. The findings suggest that registered TCM research in the Balkans remains fragmented, geographically concentrated, and predominantly focused on acupuncture. Broader geographical participation, prospective registration, consistent reporting, and investigation of a wider range of TCM modalities could strengthen the regional evidence base. Future research linking registered trials with subsequent publications could additionally provide insight into publication rates, reporting quality, and research transparency.

Conclusion

This mapping study identified 11 registered interventional clinical trials investigating TCM-related interventions in the Balkan region. Research activity was concentrated

predominantly in Greece, Slovenia, and Croatia, while one multinational trial included a study site in Romania. Several Balkan countries had no eligible registered interventional trials identified through the applied search strategy.

Acupuncture and acupuncture-related techniques represented the predominant interventions, while other major TCM modalities, including Chinese herbal medicine, moxibustion, and cupping, were not similarly represented. Clinical indications were heterogeneous but focused primarily on pain, musculoskeletal disorders, migraine, and perioperative symptom management.

These findings indicate that registered TCM clinical research in the Balkans remains limited and unevenly distributed. Broader participation across Balkan countries, investigation of a wider range of TCM modalities, prospective trial registration, and transparent reporting could contribute to the development of a more comprehensive regional evidence base. Future linkage of registered trials with subsequent publications may provide further insight into the development, reporting quality, and transparency of TCM clinical research in the region.

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