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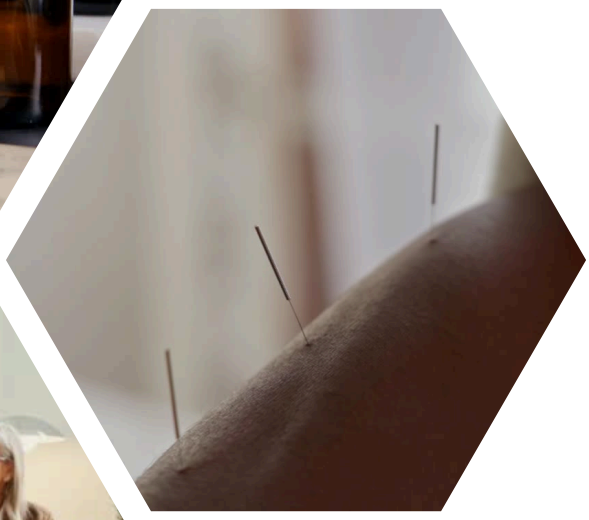

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*Editorial*

# Sex- and Country-Based Authorship Representation in the Journal of Complementary Therapies in Health: Statistics for 2023/2024.

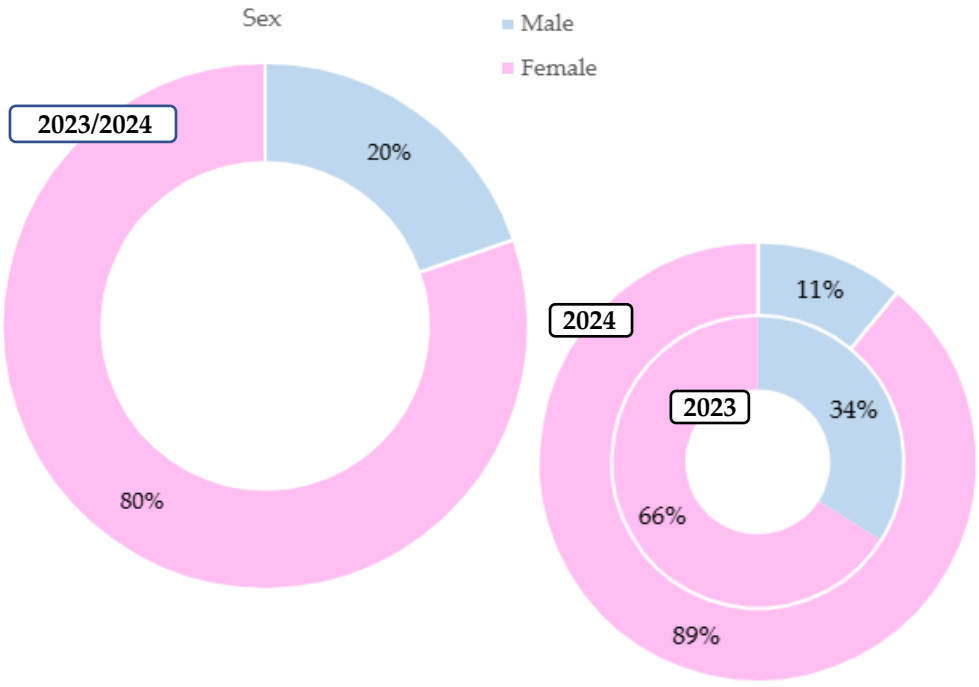
The Journal of Complementary Therapies in Health (JCTH) is committed to fostering a diverse and inclusive research community. As part of this commitment, we regularly analyse authorship data to assess sex and geographical representation. This editorial presents an overview of the sex and country-based authorship statistics for articles published in the JCTH during 2023 and 2024.

**Jorge Magalhães Rodrigues MSc, LAc, CMD, EP, Editor-in-chief**

## Sex representation

The percentage of female authors has steadily increased over the years in several fields. However, several reports still point to an unbalanced ratio, with male authors still being the majority [1-3].

As can be observed in Figure 1, female authors were dominant in the first two years of the JCTH's publications (2023/2024). From 2023 to 2024, there was an increase in female authors from 66% to 89%, meaning that male authors were underrepresented, countering general trends in many research fields.

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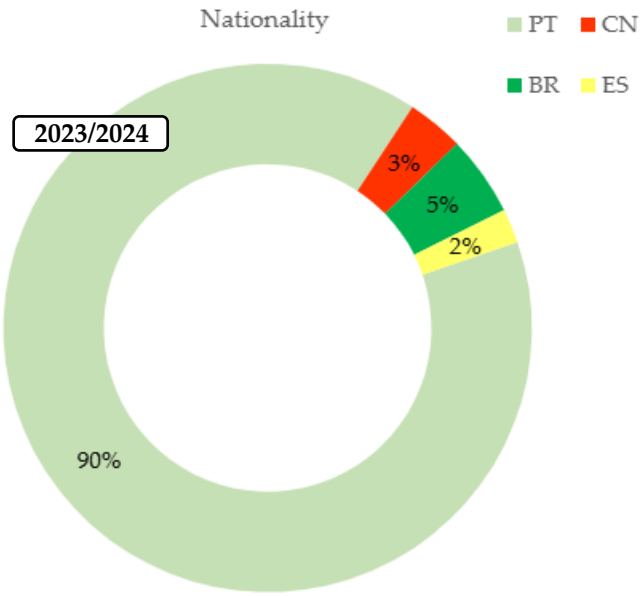
## Country Representation

The JCTH welcomes submissions from researchers worldwide. We are committed to promoting international collaboration and diversity in research. By publishing research from a variety of countries, we pretend to reflect the global nature of complementary therapies in health. According to Figure 2, there is a clear dominance of Portuguese nationals publishing in the JCTH with 90% of authors coming from this country (in 2023 and 2024).




This rate is perceived as natural since the JCTH has several research connections with organizations from this country for the organization of scientific events such as the International Congress held in 2023 [4] and the Portuguese Symposium in 2024 [5]. Therefore, despite being an International Journal, the JCTH has started being known in this geographical area. With 10%, Brazil, Spain and China are the other represented countries.

**Future Directions**

To further promote diversity and inclusion, the JCTH will continue to encourage submissions from underrepresented groups.

We will actively seek submissions from researchers from diverse backgrounds, including male and female authors, minority groups, and researchers from low- and middle-income countries.

As well, there is also the need to study sex representation in the research field of complementary therapies to better understand the tendencies observed in this analysis.

With this report, the JCTH will be able to create strategies to allow a more equitable and inclusive research environment and to advance the field of complementary therapies in health.

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*Review*

# The Role of Acupuncture in Depression Management: Insights on evidence and treatment options.

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**Abstract:** Depression, a prevalent mental health disorder, significantly impacts individuals' quality of life. While conventional treatments like medication and psychotherapy are effective, some individuals may benefit from complementary therapies. Acupuncture, a core component of Traditional Chinese Medicine, has garnered attention as a potential adjunctive treatment for depression.
By stimulating specific acupuncture points, acupuncture can influence the body's energy levels, neurotransmitter systems, and neuroendocrine regulation. This can lead to relieving depressive symptoms, such as sadness, fatigue, and loss of interest. Several studies, including meta-analyses, have demonstrated the efficacy of acupuncture in reducing depressive symptoms, particularly when combined with conventional treatments. However, the specific mechanisms underlying acupuncture's effects on depression remain to be fully elucidated.
While acupuncture offers a promising approach to managing depression, further research is needed to establish standardized treatment protocols, optimize dosage and treatment duration, and assess long-term outcomes. Additionally, large-scale, well-designed randomized controlled trials are essential to strengthen the evidence base.
By addressing these limitations and pursuing further research, it will be possible to understand the full potential of acupuncture as a complementary tool in the treatment of depression.

**Keywords:** Depression; Acupuncture; Traditional Chinese Medicine.

**Citation:** Serra E.M. The Role of Acupuncture in Depression Management: Insights on evidence and treatment options. Journal of Complementary Therapies in Health. 2025;3(1) 10.5281/zenodo.14571602

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## 1. Introduction

Ancient Chinese medical texts laid the foundation for many principles still utilized in modern Chinese medicine [1]. In the chapter on Pathogenic Wind of the Ling Shu [2], it is written that the Yellow Emperor said: "In a way, all sick people know the causes of their illnesses, as the Master has already explained. But there are those who find no pathogenic influence and have no worries or fears in their minds, yet they still fall ill suddenly."

Most patients with depression are treated in primary care settings within Western medicine and do not require hospitalization. Primary care guidelines typically recommend that depression be managed primarily with antidepressants [3]. A variety of psychological interventions, including cognitive-behavioural therapy, interpersonal therapy, psychotherapy, and counselling, are also recommended treatment options [3-5]. However, conventional medications can have side effects, the effectiveness of psychological interventions can vary depending on factors such as therapist expertise, patient engagement, and the specific therapy used, and certain treatment-resistant types of depression may develop [6-9].

Several research studies have explored the treatment of depression using Traditional Chinese Medicine (TCM) [10-18]. This study aims to actively contribute to clinical research by implementing TCM therapies in practice and to verify their efficacy and potential for enhancing the treatment of this disorder. While the study will provide some background information on depression from a Western perspective, the primary focus will be on TCM.

## 2. Depression

Modern society, with its fast-paced lifestyle and numerous challenges, can significantly impact mental health, leading to negative consequences for individuals, families, and society as a whole [19-25].

The World Health Organization [26,27] states that over 50% of the population in middle- and high-income countries will experience at least one mental disorder during their lifetime. As mental illness affects people from all walks of life, it is a major public health concern with far-reaching implications.

Depression, a common mental health disorder, can manifest in various ways and significantly affect individuals globally. The National Institute of Mental Health [28] defines depression as a serious mood disorder that can disrupt daily functioning, cognitive processes, and behaviour. Symptoms include persistent sadness, hopelessness, irritability, and a loss of interest in activities. Depression is a leading cause of disability worldwide, affecting approximately 300 million people and increasing by 18.4% from 2005 to 2015 [29]. Furthermore, it is a major risk factor for suicide, with approximately 800,000 deaths annually [27].

In severe cases, symptoms may appear without any apparent connection to traumatic life events and can last for several months. In milder forms, symptoms are less intense, allowing individuals to maintain their daily activities, although feelings of fatigue, sadness, and disinterest are present and may persist for years. In some cases, depression does not manifest as sadness but through symptoms such as fatigue, nonspecific pain, chest tightness, insomnia, and digestive disturbances (nausea, vomiting, diarrhoea), which can lead to misdiagnosis and delay treatment [30-33].

Generally, depression results from a combination of genetic, biological, environmental, and psychological factors [34-36].

## 3. Depression and TCM

TCM, a system rooted in millennia of philosophical and observational wisdom, is based on principles such as the five elements, *Yin* and *Yang*, the circulation of *Qi* and Blood, and the importance of *Zang-Fu* organs [37-41]. These principles view the human body as a microcosm, reflecting the patterns of nature [37].

TCM recognizes the influence of seasonal changes, daily cycles, and emotions on the body's energy balance. This holistic approach to health and disease emphasizes the importance of maintaining energy balance to prevent illness [42].

According to Silva [43] and Ferreira *et al.* [37], TCM views depression as an imbalance in the flow of *Qi* (vital energy) and Blood, often affecting organs like the liver and heart. This imbalance can manifest in physical and emotional symptoms, highlighting the intricate connection between mind and body.

In conventional Medicine, psychiatry is a complex field and mental illnesses frequently coexist with other mental and physical conditions [44]. Table 1, adapted from Soares Bernardo [42], provides a comparative analysis of TCM and conventional Medicine depression patterns, based on common symptoms.

### *3.1. Acupuncture for depression*

From a scientific perspective, acupuncture engages multiple physiological mechanisms. When an acupuncture point is stimulated, it initiates a complex neural response, resulting in the release of various neurotransmitters and hormones [45-47]. These neurochemical changes can alleviate pain, reduce inflammation, and mitigate stress; thereby promoting overall well-being [46]. Acupuncture is believed to harmonize the body's physiological functions.

Several studies investigate the application of acupuncture in patients with depression.

Table 1. Comparative analysis of TCM and conventional Medicine depression patterns, adapted from Soares Bernardo [42].

| TCM Pattern | Conventional Diagnosis | Common Symptoms |
|---|---|---|
| *Qi* Stagnation | Premenstrual Dysphoric Disorder, Disruptive Mood Dysregulation Disorder | Chest tightness, irritability, abdominal distension, irritability, temper outbursts |
| Heart Fire | Major Depressive Disorder, Premenstrual Dysphoric Disorder | Insomnia, mental agitation, intense emotions, affective lability, anxiety |
| *Qi* and Blood Deficiency | Major Depressive Disorder, Persistent Depressive Disorder | Fatigue, weakness, lack of concentration |
| Dampness and Cold Accumulation | Major Depressive Disorder | Lethargy, mental fog, heaviness |
| Kidney Deficiency | Major Depressive Disorder, Persistent Depressive Disorder, Premenstrual Dysphoric Disorder | Chronic fatigue, lack of motivation, difficulty concentrating, decreased interest |
| Interior Wind Upward Disturbance | Premenstrual Dysphoric Disorder, Major Depressive Disorder, Persistent Depressive Disorder | Intrusive thoughts, irritability, mental agitation, low self-esteem, hopelessness |
| Wind-Cold Attack | N/A | Aversion to cold, lethargy, body aches |
| Blood Stagnation | Persistent Depressive Disorder, Major Depressive Disorder | Persistent pain, obsessive thoughts, emotional heaviness, low self-esteem, hopelessness |

A meta-analysis by Chan *et al.* [48] examined the effectiveness of combining acupuncture and antidepressant medication for the treatment of depression. The authors identified clinical studies comparing the combination therapy to antidepressant monotherapy. The results consistently demonstrated that the combination approach was superior in reducing depressive symptoms. This suggests that acupuncture can augment the therapeutic benefits of antidepressant medication. The synergistic effect may be attributed to the complementary mechanisms of action of these two modalities, which target various physiological systems involved in mood regulation.

Another meta-analysis conducted by Smith *et al.* [49] investigated the efficacy of acupuncture as an intervention for depression. The findings suggest that acupuncture may have a positive impact on depressive symptoms. When combined with antidepressant medication, acupuncture was found to be more effective in reducing depression severity and minimizing medication-related side effects compared to medication alone. However, the combination therapy did not demonstrate significant advantages in terms of achieving remission from depression or improving emotional quality of life. In comparison to psychological therapy, acupuncture showed superior short-term outcomes and fewer adverse effects. However, the long-term benefits of acupuncture in terms of reducing depression severity were less pronounced compared to psychological therapy.

Furthermore, the meta-analysis by Armour *et al.* [50] synthesized data from multiple clinical trials involving depressed patients who received acupuncture or a control intervention (e.g., placebo, no treatment). The findings consistently indicated that acupuncture was significantly more effective in reducing depressive symptoms compared to control conditions. This suggests that acupuncture may be a valuable therapeutic option for patients with depression. The observed benefits may be related to acupuncture's ability to harmonize the body's energy flow, alleviate stress and tension, and stimulate the release of neurotransmitters such as serotonin and dopamine, which are implicated in mood regulation.

The recent systematic review and network meta-analysis by Chen *et al.* [51] aimed to assess the efficacy and safety of acupuncture for depression. Twenty-two randomized controlled trials, published in English, were included in the analysis. The results of the network meta-analysis demonstrated that electroacupuncture combined with antidepressant medication was the most effective treatment, followed by manual acupuncture combined with antidepressants and manual acupuncture alone. These findings suggest that acupuncture, either as a standalone treatment or as an adjunct to pharmacological therapy, can be a safe and beneficial option for managing depression.

Based on the available scientific evidence, acupuncture appears to be a promising therapeutic option for managing depression, particularly when used in conjunction with conventional treatments.

3.1.1. Treatment options

The specific acupuncture points and meridians used in clinical practice for the treatment of depression vary depending on the acupuncturist's approach and the individual patient's needs. However, some common points and meridians can be suggested:

- *Baihui* (GV20): Located at the crown of the head, this point is often used to treat depression and anxiety.

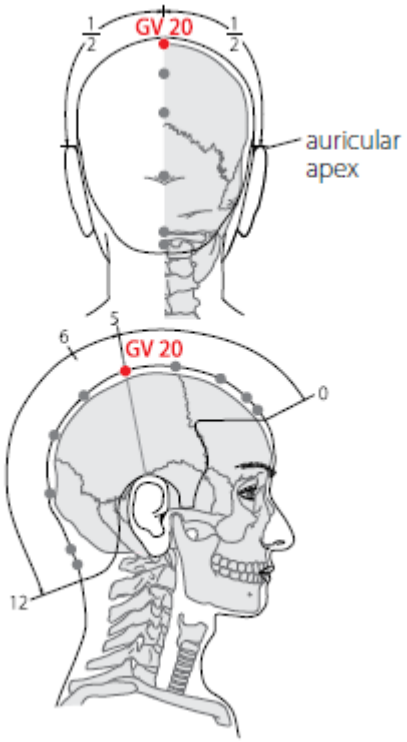



Figure 1. Baihui acupuncture point location. Retrieved from World Health Organization 1.

- *Yintang* (EX-HN3): Situated between the eyebrows, this point is commonly used for anxiety and depression.
- Heart Meridian (HT): This meridian is frequently used to treat anxiety and depression, and includes points like *Shenmen* (HT7).

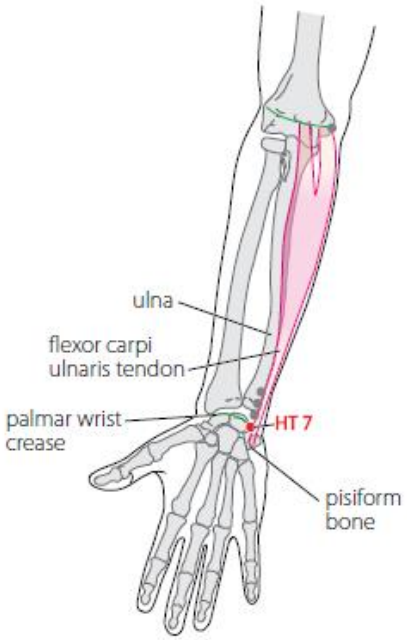



Figure 2. *Shenmen* acupuncture point location. Retrieved from World Health Organization [1].

- Liver Meridian (LR): This meridian is often used for depression and includes points such as *Taichong* (LR3) and *Xingjian* (LR2).

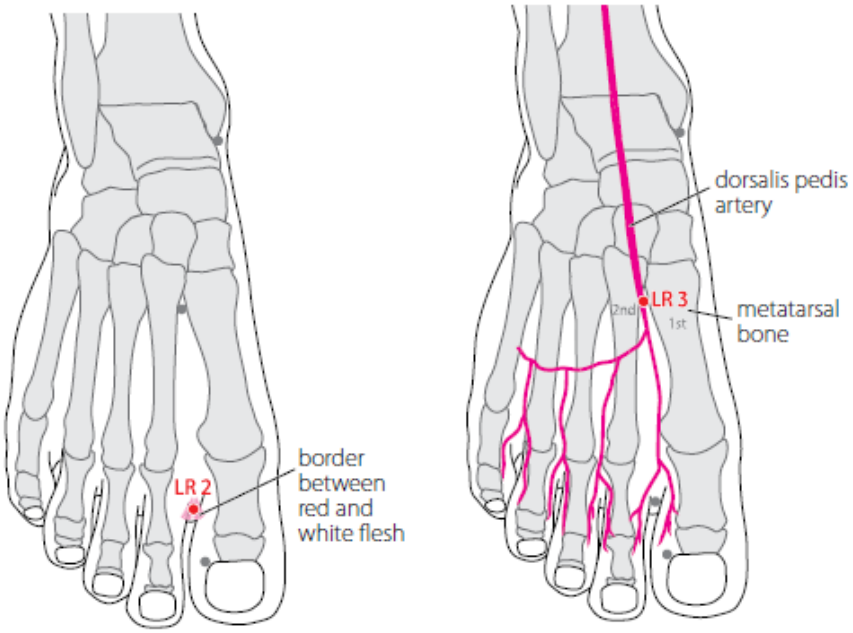



Figure 3. *Taichong* and *Xingjian* acupuncture point location. Retrieved from World Health Organization [1].

- Spleen Meridian (SP): This meridian is commonly used for anxiety and depression, and includes points like *Sanyinjiao* (SP6) and *Taibai* (SP3).

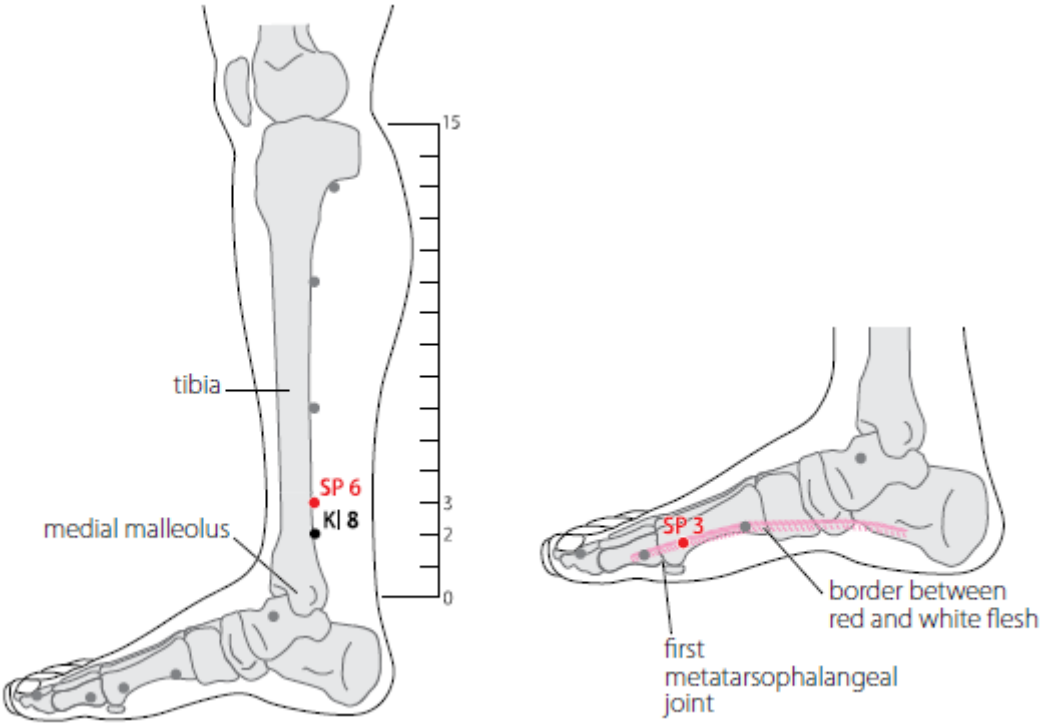



Figure 4. *Sanyinjiao* and *Taibai* acupuncture point location. Retrieved from World Health Organization [1].

It is important to note that the specific acupuncture points and meridians used will vary based on the individual patient's assessment and the acupuncturist's diagnosis. While the points mentioned above are commonly used, others may be considered for treating depression, such as:

- *Hegu* (LI4): Located between the thumb and index finger, this point is often used for anxiety and depression.

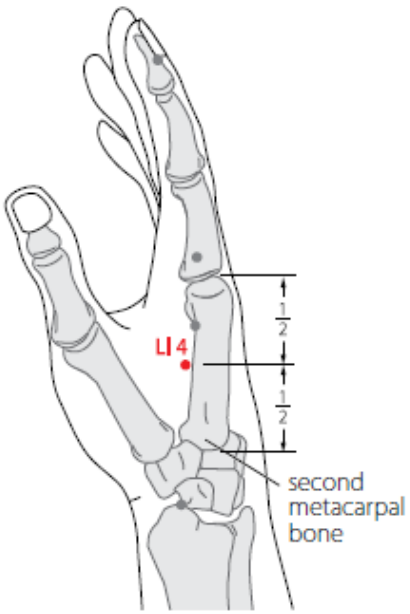



Figure 5. *Hegu* acupuncture point location. Retrieved from World Health Organization [1].

- *Zusanli* (ST36): Found below the knee, this point is commonly used to treat fatigue and depression.

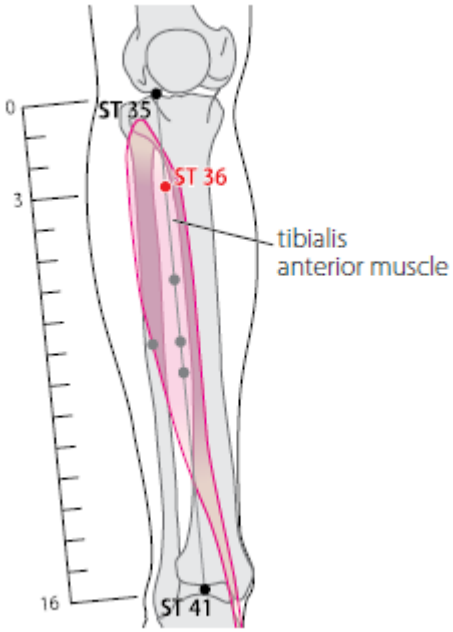



Figure 6. *Zusanli* acupuncture point location. Retrieved from World Health Organization [1].

- *Fengchi* (GB20): Located at the base of the skull, this point is often used for headaches and depression.

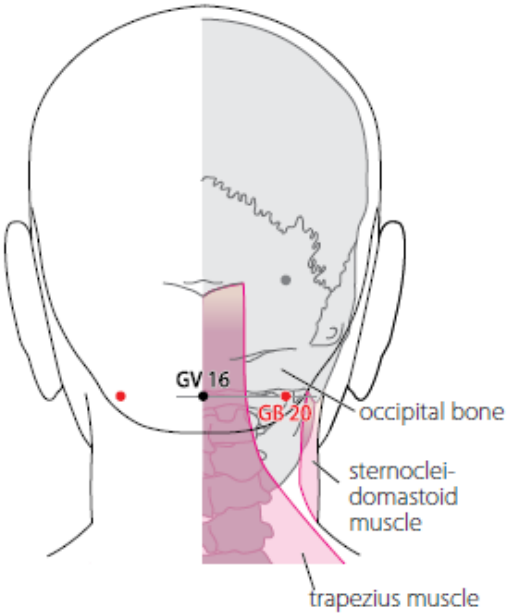
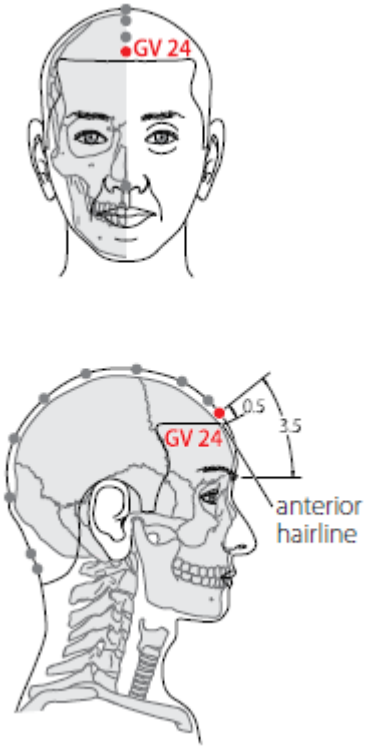



Figure 7. *Fengchi* acupuncture point location. Retrieved from World Health Organization [1].

- *Shenting* (GV24): Located at the top of the head, this point is commonly used for anxiety and depression.




- *Yifeng* (TE17): Located behind the ear, this point is frequently used for anxiety and depression.

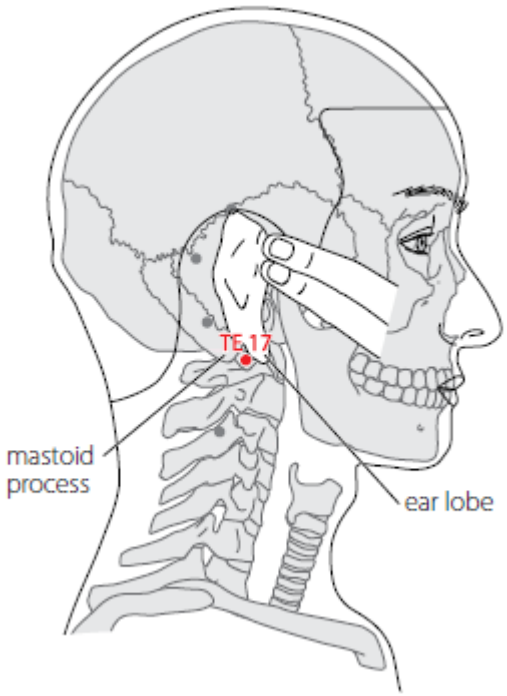



Figure 9. *Yifeng* acupuncture point location. Retrieved from World Health Organization [1].

## 4. Final Remarks

The integration of TCM with Western medicine offers a promising approach to managing depression. Acupuncture, a core component of TCM, demonstrates the potential to

alleviate depressive symptoms and enhance overall well-being. By targeting the body's energy flow and neurotransmitter systems, acupuncture may provide additional therapeutic benefits, particularly when combined with conventional treatments.

While the evidence supporting the efficacy of acupuncture for depression is growing, several limitations should be acknowledged.

Studies on acupuncture often exhibit methodological heterogeneity, including variations in treatment protocols, patient populations, and outcome measures. This can make it challenging to draw definitive conclusions. As well, most studies have focused on short-term outcomes. Long-term studies are needed to assess the sustained effects of acupuncture on depression.

Worthy of consideration, the effectiveness of acupuncture may be influenced by cultural and contextual factors, such as patient expectations, therapist experience, and the specific cultural context of the treatment setting.

To further elucidate the mechanisms of action and optimize the clinical application of acupuncture for depression, future research should consider several aspects.

Developing standardized protocols for acupuncture treatment of depression can improve the consistency and reproducibility of research findings.

Moreover, investigating the underlying mechanisms of acupuncture's effects on depression, such as neurotransmitter modulation, neuroendocrine regulation, and immune system function, can deepen our understanding of its therapeutic potential.

It is also important to keep exploring the synergistic effects of acupuncture with other therapeutic modalities, such as medication and psychotherapy, to optimize treatment outcomes.

By addressing these limitations and pursuing further research, the scientific evidence may confirm the potential of acupuncture as a valuable tool in the management of depression.

## 5. Conclusions

Acupuncture, a cornerstone of Traditional Chinese Medicine, shows promise as a complementary treatment for depression. By modulating the body's energy flow and neurotransmitter systems, acupuncture can alleviate depressive symptoms, reduce stress, and improve overall well-being. While further research is needed to fully understand its mechanisms of action and optimize its clinical application, acupuncture offers a holistic approach to mental health that may benefit many individuals.

**Conflicts of Interest:** The author declares no conflicts of interest.

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*Review*

# Traditional Chinese Medicine for the Prevention and Management of Metabolic Diseases.

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**Abstract:** Background: Metabolic diseases, affecting the body's energy production and nutrient utilization, are increasingly prevalent globally. These pathologies are complex, involving genetic, epigenetic, socio-environmental, sociocultural, and psychosocial factors, and are often linked to insulin resistance, chronic inflammation, and hormonal imbalances. This review explores the multifaceted aetiology of metabolic diseases and delves into the therapeutic potential of Traditional Chinese Medicine approaches.
Methods: This review synthesizes current literature on the aetiology of metabolic diseases, including genetic and epigenetic factors, as well as the influence of lifestyle, environment, and psychosocial stress. It further examines the Traditional Chinese Medicine perspective on metabolic diseases, focusing on bioenergetic mechanisms, and explores the therapeutic applications of dietotherapy, phytotherapy, acupuncture, and moxibustion in managing these conditions. Relevant studies, including systematic reviews, meta-analyses, and clinical trials, were considered.
Results: From a traditional perspective, imbalances in Qi, particularly involving the Spleen-Pancreas and Liver, are central to the development of these conditions. The review further demonstrates the potential of Traditional Chinese Medicine therapies, including tailored diets, herbal formulas, acupuncture, and moxibustion, in addressing the underlying imbalances and managing metabolic diseases such as diabetes and obesity. Specific points and herbal formulas commonly used in TCM for these conditions are discussed.
Conclusions: This review suggests that Traditional Chinese Medicine offers promising complementary therapeutic strategies for the prevention and management of metabolic diseases. Further research, including rigorous clinical trials, is warranted to fully elucidate the efficacy and mechanisms of TCM interventions for metabolic diseases and to facilitate their integration into conventional healthcare systems.

**Keywords:** Obesity; Diabetes Mellitus; Metabolic Diseases; Traditional Chinese Medicine; Acupuncture; Herbal therapy; Diet; Moxibustion.

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## 1. Background

Metabolic diseases are pathologies that affect the body's metabolism, which is a set of biochemical processes responsible for energy production and the maintenance of cellular functions [1]. These pathologies typically involve the way the body uses and/or stores nutrients such as carbohydrates, proteins, and lipids, and are frequently associated with hormonal dysfunctions and abnormalities in energy balance [2,3].

Biological mechanisms are crucial processes for maintaining health and preventing diseases, such as metabolic diseases. Affected mechanisms that may lead to metabolic diseases include, among others, insulin resistance, hormonal imbalances, chronic inflammation, oxidative stress, lipid dysregulation, gut microbiota dysfunction, and mitochondrial and endothelial dysfunction [1,4].

Insulin resistance involves the excessive flow of fatty acids released into adipose tissue and accumulated in other parts of the body, such as the liver and skeletal muscles, leading to adipose tissue dysfunction and impairing insulin receptors and secretion. In obesity, pro-inflammatory molecules (cytokines, adipokines, and chemotactic factors) are released from adipose tissue, which is called low-grade chronic inflammation [5,6]. Excess nutrients and fat accumulation lead to increased production of reactive oxygen species, which damage proteins, lipids, and DNA, impairing insulin signalling and generating oxidative stress [7,8].

It is known that low-intensity chronic inflammation is present in various stages of chronic non-communicable diseases, such as metabolic diseases [9-11].

Studies have shown that the intestinal flora of an overweight person has less variety of bacteria as well as inflammatory markers in the blood [12-14].

In addition, the effect of inflammatory bacterial substances hinders the work of the thyroid, which leads it to produce fewer hormones, making it slower to burn fat [15]. Low-grade chronic inflammation may not only be produced by bacteria but also by other factors, such as excess estrogen, vitamin D deficiency, poor diet or excessive gluten consumption [16-19].

Alarmingly, the prevalence of metabolic diseases has been growing exponentially. A WHO report on obesity in Europe states that overweight and obesity rates have reached epidemic proportions across the region, where 59% of adults and almost 1 in 3 children are overweight or obese [20]. On the other hand, the worldwide prevalence of diabetes, estimated in 2021, is about 10.5% among those aged 20 to 79, corresponding to 536.6 million people [21].

### *1.1. Aetiology*

According to Fan [22], the aetiology of metabolic diseases is complex, with several factors potentially explaining part of the etiological "cascade."

At its base, the aetiology stems from genetic and epigenetic factors, and these, associated with behavioural risk factors, increase the likelihood of developing metabolic diseases.

#### Genetic Factors

At the level of genetic factors associated with so-called heredity, the predisposition to the prevalence of these pathologies comes from specific mutations called genetic polymorphisms, which are variations in genes.

According to Brown *et al.* [23], large-scale genome-wide association studies have helped to advance the identification of common genetic variations associated with insulin resistance and metabolic syndrome. More recently, exome sequencing has allowed the identification of rare variants associated with the pathogenesis of these conditions [24]. According to the authors [23], many genetic variants involved in the pathogenesis of metabolic syndrome are associated with lipid metabolism.

Furthermore, Panera *et al.* [25] state that growing evidence suggests that genetic variation (typically single nucleotide polymorphisms) can also affect epigenetic profiles, independently or in combination with environmental factors.

#### Epigenetic Factors

Epigenetic factors influence how genes are expressed without altering the DNA. These are associated with our lifestyle, such as inadequate diet, sedentary behaviour, stress, poor sleep habits, and even gestational and early-life nutrition [26,27]. Adequate nutrition begins in the first thousand days of life, from gestation to 2 years of age. It is essential to promote good nutrition, as this will impact the emergence or not of metabolic diseases [27].

After several studies suggested that insulin resistance is more likely in children who received formula milk than in children who received breast milk, a study by the World

Health Organization with a sample of more than 100,000 children aged 6 to 9 confirmed breastfeeding as a protective factor for childhood obesity [28].

However, in general, an inadequate diet, rich in sugars, saturated fats, and processed foods, promotes inflammation, insulin resistance, and the accumulation of body fat [29].

Sedentary behaviour is also closely associated with and present in our civilization, which leads to weight gain and increased insulin resistance [30,31]. Similarly, poor sleep habits increase inflammatory markers in the body, which contributes to insulin resistance [32-35].

Socio-environmental Factors

The social determinants of health, especially socio-environmental factors, play a crucial role in the prevalence of metabolic diseases such as obesity and diabetes. Thus, the complex interaction between the environment in which we live and our food and lifestyle choices significantly shapes our health status.

An excellent example is the proliferation of ultra-processed foods, fast food, and sugary drinks in low-income communities, which is an alarming phenomenon [36]. This abundant and accessible supply, often accompanied by lower prices, significantly contributes to the increased prevalence of obesity [37]. Several factors explain this relationship.

1. Ultra-processed foods are generally high in calories, saturated fats, added sugars, and sodium, and low in fibre, vitamins, and minerals [38-40]. This unbalanced nutritional composition favours weight gain and the development of insulin resistance.
2. The food industry invests heavily in marketing aimed at children and adolescents, promoting the consumption of ultra-processed foods and encouraging unhealthy eating habits [41,42]. In addition, the ease and speed of preparing fast food makes it attractive to people with little time available to cook, such as workers with long hours and single parents [43]. As well, ultra-processed foods are often cheaper than fresh and natural foods, making them more accessible to families with limited incomes.
3. The physical environment in which we live directly influences our opportunities to engage in physical activity and adopt healthy lifestyle habits. The presence of green spaces, bike paths, and leisure areas promotes the practice of outdoor physical activities, which contributes to weight loss, improved cardiovascular health, and stress reduction [44-46].
4. Moreover, exposure to atmospheric and chemical pollutants can have a significant impact on metabolism and increase the risk of metabolic diseases. Epidemiological studies have shown associations between air pollution and increased prevalence of obesity, diabetes, and cardiovascular diseases [47,48].

In this way, we can affirm that socio-environmental factors play a fundamental role in determining metabolic health. The availability and access to ultra-processed foods, the lack of green spaces, and exposure to pollution are just some examples of how the environment in which we live can influence our choices and increase the risk of chronic diseases. Public policies and health promotion programs must consider these factors when developing strategies to prevent and control metabolic diseases.

Sociocultural Factors

Culture plays a central role in defining the eating habits of people. Culinary traditions, celebrations, and social events are intrinsically linked to food [49]. In some cultures, for example, the consumption of ultra-processed foods and sugary drinks may be valued, while in others, the diet is based on fresh and natural foods. These cultural differences directly influence the composition of the diet and, consequently, the risk of metabolic diseases [50,51].

In addition to culture, the level of education is associated with knowledge about nutrition and health [52]. People with higher levels of education tend to have greater access to

information about healthy eating and to adopt more appropriate eating habits. However, even people with a high level of education can be influenced by other sociocultural factors that make it difficult to adopt healthy behaviours [53].

Psychosocial Factors

Chronic stress can trigger a series of physiological changes that contribute to the development of metabolic diseases [54]. Increased levels of cortisol and other hormones can lead to insulin resistance, increased appetite, and abdominal fat deposition [55,56]. In addition, stress can lead to the adoption of unhealthy behaviours, such as excessive consumption of ultra-processed foods and sedentary behaviour.

Closely related to stress, depression can play an important role, since depression and metabolic diseases have a bidirectional relationship [57,58]. Depression can lead to changes in appetite, sleep, and physical activity, contributing to weight gain and the development of insulin resistance. On the other hand, metabolic diseases can increase the risk of developing depression. Integrated treatment of depression and metabolic diseases is essential to improve the quality of life of patients and reduce the risk of complications [57,59].

Also, social isolation is associated with several health problems, including metabolic diseases [60]. People who live socially isolated tend to have less healthy lifestyle habits, such as excessive consumption of ultra-processed foods and insufficient physical activity. In addition, social isolation can lead to hormonal and inflammatory changes that increase the risk of chronic diseases [61].

## 2. Metabolic Diseases and Traditional Chinese Medicine

### *2.1. Bioenergetic Mechanisms*

The Eastern approach to metabolic diseases is characterized by a holistic perspective where prevention, energy balance, and harmony between body and mind are fundamental [62,63].

In Traditional Chinese Medicine, the focus is on the balance of vital energy, known as "Qi." According to this medicine, metabolic diseases derive from energy imbalances in the body that originate pathologies, influencing not only the energy system but also the organs [64,65].

This is based on the energy that flows through meridians, called energy channels in the body, to which poor circulation or insufficiency of *Qi* can lead to various diseases [64,66]. The organs especially affected in metabolic diseases are the Spleen-Pancreas (*Pi*) and the Liver (*Gan*), both considered central to the processing and distribution of nutrients and energy. The Spleen-Pancreas is responsible for the transformation and transport of nutrients obtained from food, transforming them into *Qi* and Blood (*Xue*). When there is a deficiency in the Spleen-Pancreas, this can lead to poor digestion, chronic fatigue, and accumulation of 'dampness'. The Liver, on the other hand, regulates the smooth distribution of *Qi* and Blood in the body. Any stagnation or deficiency in Liver *Qi* can manifest as insulin resistance, hormonal imbalances, and chronic inflammation.

### *2.2. Diabetes Mellitus*

According to the classic Huangdi Neijing [67], obesity is the result of overeating, and diabetes is referred to as the *Xiaoke* disease, which is a consequence of obesity. Complications of *Xiaoke* disease include stroke, carbuncle, and foot gangrene [68,69]. In Chinese, *Xiao* means loss of body weight and *Ke* means thirst, which is similar to the symptoms of diabetes, that is, weight loss accompanied by increased fluid intake, eating, and urination. In Traditional Chinese Medicine theory, *Xiaoke* is considered the result of a deficiency of *Yin* with 'dry-heat'. The treatment of diabetes should focus on replenishing *Yin* (fluid) and evacuating 'fire' ('heat') from the body [70].

In addition, the production of 'heat' consumes *Yin*, harming the Lungs, Stomach, and Kidneys. This pathology can be induced by prolonged or sudden emotions that lead to

stagnation of Liver *Qi*, manifesting 'heat'. We can observe imbalances at the level of the three *jiaos*. The Upper *Jiao* is characterized by polydipsia (excessive fluid intake, dry mouth). The Middle *Jiao* is characterized by polyphagia (increased appetite, rapid digestion, and frequent hunger). The Lower *Jiao* is characterized by polyuria (frequent and urgent urination); we can also find a characteristic of sweet-smelling urine (glycosuria), the inability of the kidneys to reabsorb glucose.

### *2.3. Obesity*

Obesity is another pathology of metabolic diseases and is characterized by an internal imbalance that leads the body to be unable to process and transform food effectively, leading to the accumulation of pathogenic substances such as 'dampness'/'phlegm'. This comes from an imbalance in the earth element, generating a spleen deficiency that leads to an accumulation of dampness/phlegm and stagnation of *Qi* and *Xue* [71,72]. Emotions such as obsessive and constant thoughts and frustration or anger lead to the weakening of the Spleen and stagnation of Liver *Qi*, respectively.

Traditional Chinese medicine has long been used to treat diseases, playing an important role in the treatment of obesity [72,73].

## 3. Prevention and Management of Metabolic Diseases: Therapeutic Approaches in Traditional Chinese Medicine

### *3.1. Dietotherapy*

Modern knowledge about nutrition and diseases is often based on the notion that vitamins proteins, carbohydrates, and fats are essential for a balanced diet, and that each of these has a specific function, being essential for maintaining the functions of the body [74].

Therapeutic dietetics in Chinese medicine has always been undervalued in the West, partly because the notions of the functioning of the human body follow particular principles, different from modern scientific notions, and on the other hand, due to the lack of access to these notions both in the literature and throughout history [74].

However, the history of Chinese dietotherapy is long-standing. Imperial herbalist doctors, aligned with Confucian schools, always gave importance to "achieving nutrition" by selecting foods in an almost philosophical way [75]. It is important to mention that in these terms, "healing and nourishing come from the same source" [76].

For them, the choice was based on the appropriate quantity, neither in excess nor in scarcity, as well as having a diet based on a wide variety of foods. In section 22, chapter 81 of the Yellow Emperor's Classic of Internal Medicine [77-79], some dietary recommendations are given, for example, the five cereals (rice, sesame seeds, soy, wheat, and millet) provide nutrition, the five fruits (date, plum, chestnut, apricot, and peach) produce complementarity (assist), the five animals (cow, dog, pig, chicken, and mutton) give advantage, the five vegetables (cucurbits, chives, sprouts, shallots, and onion) are for supplementing. According to Zhi-chien [75], these were probably the first dietary guidelines in the history of mankind in which both the satisfaction of nutritional and organic needs of the body was sought. These recommendations highlight the importance of a varied and complete diet.

Throughout history, various texts have been written on the therapeutic prescription/guidance of food as well as the preparation of meals [79]. For example, in Su Wen [78], it is described that grains were boiled in soup as food for the five internal organs in ancient times. After boiling for some time, the grains fermented and turned into a puree, which can be used as a treatment for the five internal organs.

Also very important, in traditional Chinese dietotherapy, food should be in accordance with the various seasons of the year to comply with the laws of nature [79]. For example, according to the recommendations present in *Principles of Correct Diet* (*Yinshan zhengyao*), written by the imperial physician Hu Sihui in the Yuan Dynasty, "in the heat of

spring, it is appropriate to eat wheat to refresh; in the heat of summer, it is appropriate to eat mung beans to cool down; in the dryness of autumn, it is appropriate to eat sesame seeds to nourish the dryness; in the cold of winter, it is appropriate to eat millet to dispel the cold".

Increasingly, the foundations of Chinese dietotherapy have been explored, bridging the gap to Western knowledge and allowing for greater understanding [80,81]. The concrete action of Chinese dietotherapy in metabolic diseases comes mainly from its preventive capacity, not only for these pathologies but for all in general. After all, a correct and balanced diet is the basis for the balance of body and mind, as is also supported by the notion of the gut-brain axis [62,82].

The study by Yang *et al.* [83] refers to a specific form of *Yao-Shan* (or ancestral Chinese medicinal diet), used in Chinese cooking and drinks. In Table 1, the commonly used ingredients of *Yao-Shan* for *Xiao-Ke* (diabetes) can be observed.

Table 1. Yao-Shan ingredients commonly used for diabetes.

| Lan | Eupatorium fortunei |
|---|---|
| Gouqizi | *Lycium barbarum* |
| Baiying | *Solanum lyratum* |
| Gegen | *Pueraria lobata* |
| Gualougen | *Trichosanthes kirilowii* |
| Zhimu | *Anemarrhena asphodeloides* |
| Fuping | *Lemna minor* |
| Wanggua | *Trichosanthes cucumeroides* |

Indeed, the polysaccharides and flavonoids of *Gouqizi* [84-86], polysaccharides and puerarin from *Gegen* [87-89], mangiferin from *Zhimu* [90], and protein tyrosine kinase from *Gualougen* [91], are antidiabetic bioactive molecules.

However, in this specific issue, it is difficult to separate Chinese dietotherapy from Chinese phytotherapy.

*3.2. Phytotherapy*

Chinese phytotherapy (or Chinese herbal medicine) has been developed over the centuries according to the plants available regionally [92] and is, together with Ayurvedic herbal medicine, a world-renowned and currently still in use system [93,94].

Chinese phytotherapy follows the principles of Traditional Chinese Medicine, being simultaneously a preventive and interventional therapeutic technique.

The use of preventive phytotherapy fits into the approach of dietotherapy, as we saw earlier, and is based mainly on the use of plants in the preparation of food, and in simple infusions to maintain health.

However, phytotherapy is based on the use of specific combinations of plants and/or other mineral or animal components [95].

This way, it becomes easier to study the effects of phytotherapy on metabolic diseases.

For example, the study by Liu *et al.* [96] suggests that a formula composed of *Puerariae radix*, *Lycium barbarum*, *Crataegus pinnatifida*, and *Polygonati rhizome*, is capable of protecting against the development of diabetes and non-alcoholic fatty liver disease.

On the other hand, the *Xiao-Ke-Yin* formula was developed to treat metabolic diseases [97]. This formula is composed of nine herbs, namely *Dioscorea Oppositifolia*, *Polygonatum Sibiricum*, *Rhizoma Polygonati Odorati*, *Folium Mori*, *Crataegus Pinnatifida*, *Rhizoma Phragmitis*, *Angelica Sinensis*, *Gardenia Jasminoides* and *Pueraria Lobata*. In fact, the study developed by Li *et al.* [97] provides evidence that this combination can produce therapeutic effects on glucolipid metabolism. The mechanisms of *Xiao-Ke-Yin* involve decreasing the gene expression of hepatic cholesterol biosynthesis. In addition, changes in the intestinal

microbiota were observed, reducing the levels of lithocholic acid and deoxycholic acid, thus promoting the synthesis of hepatic bile acids and inhibiting the FXR-FGF15 signalling pathway. It can also regulate the metabolism of amino acids (arginine biosynthesis; alanine, aspartate and glutamate metabolism; phenylalanine, tyrosine and tryptophan biosynthesis and tryptophan metabolism), which play an important role in the pathological process of metabolic diseases.

The study by Lian *et al.* [98] investigated the efficacy of the *Jinlida* formula in conjunction with metformin for the treatment of type 2 diabetes.

The composition of this formula consists of 17 herbs, including *Panax Ginseng*, *Polygonati*, *Atractylodis Lanceae*, *Sophorae Flavescentis*, *Ophiopogon japonicus*, *Rehmanniae*, *Polygoni Multiflori*, *Dogwood*, *Poria*, *Perrin*, *Coptis Chinensis*, *Anemarrhena*, *Epimedium*, *Salvia*, *Puerariae*, *Semen Litchi*, and *Cortex Lycii Radicis*.

In this study, the results indicate that *Jinlida*, when combined with metformin, significantly reduces blood sugar levels (HbA1c, fasting and postprandial glucose) compared to metformin alone. It has also been shown to improve the function of beta cells, responsible for insulin production. These results suggest that *Jinlida* may be an effective adjunct treatment for patients with type 2 diabetes who do not achieve adequate glycemic control with metformin alone. This combination may represent a new therapeutic approach for diabetes, combining Western and traditional Chinese medicine.

In turn, Yu *et al.* [99] evaluated the efficacy of the *Jiangtang Tiaozhi* formula in the treatment of patients with type 2 diabetes with obesity and high blood lipid levels. The composition of *Jiangtang Tiaozhi* is formed by *Luhui* (*Aloe vera*), *Huanglian* (*Coptis Chinensis*), *Zhimu* (*Rhizoma Anemarrhenae*), *Hongqu* (red yeast rice), *Kugua* (*Momordica Charantia*), *Danshen* (*Salvia miltiorrhiza*), *Wuweizi* (*Schisandra Chinensis*), and *Ganjiang* (dried *Zingiber Officinalis*). The formula proved to be as effective as metformin in reducing blood sugar levels. It was also able to reduce blood lipids slightly more than metformin and led to greater weight loss. It had benefits in insulin resistance and increased insulin production compared to metformin.

Thus, the study showed that *Jiangtang Tiaozhi* appears to be a safe and effective alternative for the treatment of patients with type 2 diabetes with obesity and high blood lipid levels, especially those who do not tolerate metformin. It may offer additional benefits in weight reduction and improved insulin sensitivity.

In agreement with these studies, Zhang *et al.* [100] state that traditional Chinese phytotherapy significantly improves glucose and lipid metabolism by modulating the intestinal microbiota. It further states that it can affect the abundance of mucin-degrading bacteria, bacteria with anti-inflammatory properties, bacteria-producing lipopolysaccharides and short-chain fatty acids, and bacteria with bile salt hydrolase activity. Finally, states that Chinese phytotherapy can protect intestinal barrier function, modulate metabolic endotoxemia and inflammatory responses, regulate the effects of short-chain fatty acids, modulate the gut-brain axis, regulate bile acids and tryptophan metabolism, and therefore has promising potential for the treatment of metabolic diseases.

### *3.3. Acupuncture*

Just as dietotherapy and phytotherapy overlap in some ways, the same happens with acupuncture and phytotherapy. This refers to phytoacupuncture.

While acupuncture is defined as the needling of specific points or areas of the body, usually located along the channels or conduits where vital energy (*Qi*) is believed to circulate [101-103], phytoacupuncture involves application through (1) dipping the tips of the needles in plant decoctions before insertion, or (2) injecting a certain volume of the decoction to be used, improving the effectiveness of both techniques [104].

In this topic, a systematic review conducted by Santos *et al.* [105] sought to analyze the effects of acupuncture and phytoacupuncture in the treatment of obesity. The results showed that acupuncture can significantly reduce body mass index compared to controls,

further suggesting that it may work through the regulation of hormones related to metabolism and appetite. In the case of phytoacupuncture, although the results are more varied, some studies have shown significant reductions in waist circumference and improvements in metabolic activity. Thus, the authors conclude that acupuncture and phytoacupuncture can be valuable tools for the management of excess weight, especially when used in conjunction with other healthy lifestyle practices.

Table 2 presents the acupuncture points and most used formulas in the studies analyzed by Santos *et al.* [105].

Table 2. The most used acupuncture points and formulas in the studies.

| Main Acupuncture points | Used formulas |
|---|---|
| Stomach: ST20, ST23, ST24, ST25, ST26, ST36, ST40. | *Ephedra sinica* + *Aconitum carmichaeli.* |
| Spleen-Pancreas: SP6, SP9 | *Bigiheo:* *Panax Ginseng, Astragallus Membranaceus, Discorea Batatas, Atractylodes Japonica, Poria Cocos, Citrus Unshiu, Zizyphus Jujube e Glycyrrhiza Uralensis.* |
| Conception vessel (Renmai): CV4, CV6, CV9, CV10, CV12. | *Sobeium:* *Platycodon grandiflorum, Ephedra Sinica, Morus Alba, Liriope Platyphylla, Scutelaria Baicalensis e Prunus Armeniaca.* |
| Other channels used: Lung, Small Intestine, Heart, Bladder, Sanjiao, Gallbladder, Liver, and Governing Vessel (Dumai). | *Bangkihwangkitang:* *Stephania Tetandra, Astragallus Membranaceus, Atractylodes Koreana, Glycyrrhiza Uralensis e Zingiber Officinale.* |

Another systematic review, this time with meta-analysis, by Li *et al.* [106] investigated the effectiveness of acupuncture for metabolic diseases.

In general, acupuncture monotherapy proved to be equally effective as conventional medications in controlling triglyceride and high-density lipoprotein (HDL) levels. When combined with lifestyle changes, acupuncture showed significantly better results in reducing waist circumference and body mass index.

Thus, the authors suggest that acupuncture may be effective in treating metabolic diseases, serving as an alternative or complement to conventional treatment. Table 3 shows the main acupuncture points used in the studies analyzed by the authors.

Table 3. Main channels and points according to the studies.

| Canais | Pontos |
|---|---|
| Conception vessel (Renmai) | CV12, CV6, CV10, CV4. |
| Stomach | ST36, ST25, ST40. |
| Spleen-pancreas | SP6, SP15, SP9. |
| Bladder | BL20, BL21, BL18. |
| Large Intestine | LI4 |

*3.4. Moxibustion*

Regarding moxibustion, this is the application of heat to specific acupuncture points using medicinal herbs, particularly mugwort [107]. It can be applied suspended over the chosen point and/or using the acupuncture needle.

Studies suggest that the mechanism of action of this technique is due to its stimulating thermal effect, radiation effect, or even the biological activities of the medicinal herbs

used and their smoke [108,109]. In any case, moxibustion appears to improve blood circulation [110] and activate the immune system [111].

In an experimental study [112], the effect of suspended moxibustion on the biochemical markers of subjects with high cholesterol was analyzed.

Using moxibustion at points CV8 and ST36, it was observed that after 12 weeks of treatment, fasting glucose, total cholesterol, low-density lipoprotein (LDL), and triglyceride levels decreased significantly. Only HDL levels did not change. Based on these results, the authors suggest that suspended moxibustion on these two points may improve lipid metabolism and regulate glucose metabolism.

A meta-analysis of randomized controlled trials [113] sought to evaluate the effectiveness of acupuncture with moxibustion in the treatment of obesity in adults. The results indicated that body mass index, weight, waist circumference, and triglyceride levels were significantly benefited by the intervention compared to controls. However, they found that high- and low-density lipoprotein (HDL and LDL) and cholesterol levels were not improved. According to these results, it is possible to suggest that acupuncture with moxibustion may be useful in the treatment of obesity in adults.

The authors also analyzed the frequency of use of acupuncture points by the studies included in the review, indicating that these (Table 4) may form the basis of obesity treatment.

Tabela 4. Basic points for the treatment of obesity in adults.

| Channels | Points |
|---|---|
| Stomach | ST25, ST36, ST40. |
| Conception Vessel (*Ren Mai*) | CV12, CV6. |

Thus, it can be stated that there is some evidence that supports the use of moxibustion to aid in the treatment of metabolic diseases.

**4. Final considerations and conclusions**

Despite the exploration made on the subject in question, some considerations should be made.

First, it is essential to contextualize the adherence of patients to these approaches, namely Traditional Chinese Medicine. It is essential to develop awareness actions of the population to the problem of metabolic diseases so that they can be more receptive to treatments and lifestyle changes. Also, informing about the possible effectiveness of Traditional Chinese Medicine techniques in this problem should be the next step to ensure more options for patients, mainly ensuring their complementary use to conventional treatments.

In this sense, it is important to mention that a multidisciplinary approach is viable and beneficial. Thus, it becomes essential to integrate different health professionals and areas of knowledge to offer more complete and personalized care. This way, the very changes in behaviour and life habits can be better sustained and lasting.

In addition, the development of these multidisciplinary actions in a hospital context and the national health system allows for greater accessibility through greater supply and decreased costs. The preventive treatment of metabolic diseases will, in the future, allow for a lower expense of the state itself in the treatment of consequent chronic complications.

Finally, following the principles of Traditional Chinese Medicine, it is important and beneficial to adapt and individualize treatments according to each patient. Not only will the integration of Traditional Chinese Medicine in public health care bring this benefit, but also integration in a multidisciplinary team may help to achieve this crucial goal.

Thus, we can conclude that Traditional Chinese Medicine has the potential to benefit the prevention and treatment of metabolic diseases, and it is necessary to continue investigating the effects of its techniques.

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*Review*

# Can Chikung (Qigong) Enhance Oral Health and Well-being? A Review of the Evidence.

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**Abstract:** Background: Qigong, an ancient Chinese mind-body practice integrating movement, breath, and mental focus, offers diverse health benefits including stress reduction and improved well-being. Recognized in the West as a traditional vegetative biofeedback therapy, it has shown promise in enhancing quality of life, particularly for those with chronic conditions.
Objective: This review aimed to evaluate Qigong's potential benefits for dental professionals and patients, focusing on its impact on stress, posture, musculoskeletal pain, and overall well-being within the dental context.
Results: Qigong demonstrated significant reductions in stress, anxiety, and depression, positively influencing oral health. It also attenuated burnout, improved sleep, reduced fatigue, and enhanced well-being. Furthermore, it promoted postural improvements, musculoskeletal pain relief, and optimized biomechanics, suggesting potential for mitigating occupational injuries in dental professionals. Qigong emerges as a promising preventive intervention, enhancing both physical and psychological quality of life.
Conclusions: Qigong shows potential as a valuable therapeutic adjunct in dentistry, particularly for stress-related conditions and postural imbalances. It also offers a promising approach to addressing occupational hazards in dental professionals. However, due to limited direct research on Qigong within dentistry, further rigorous studies, including randomized controlled trials, are crucial to establish its specific effects on oral health outcomes and guide its clinical integration.

**Keywords:** Dentistry; Dental Medicine; Qigong; Traditional Chinese Medicine.

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## 1. Introduction

Qigong is a Traditional Chinese Medicine discipline with its first archaeological records dating back to around 5000 BC [1-3]. Currently, in the West, it is seen as a traditional vegetative biofeedback therapy [4] where regular practice can produce psychophysiological changes [5]. Automating these processes for everyday life results in constant improvement of physical and mental health, and prevention of illnesses [6,7].

Commonly, Qigong is a collection of ancient practices that integrate controlled breathing, gentle physical postures and movements, and focused mental imagery to cultivate and balance vital energy within the body and mind [5]. It has been shown to have a wide range of health benefits [8], including improved physical and mental well-being [7,9]. It can also be beneficial for patients with serious illnesses by enhancing their quality of life [8,10,11].

Good oral health is essential for overall well-being [12,13]. It does not only contribute to a beautiful smile but also plays a crucial role in preventing various health issues [14,15]. As well, stress, anxiety and depression symptoms are often overlooked factors that can significantly affect oral health [16-18]. These psychological factors can lead to detrimental oral

habits such as bruxism, clenching, and nail biting, which can cause significant damage to teeth and gums. Furthermore, stress can weaken the immune system, making individuals more susceptible to oral infections [19-21].

This review aims to investigate the potential benefits of Qigong within the context of dental medicine. Specifically, the review will explore its possible impact on both dental professionals and patients.

**2. Stress, pain and posture**

Stress can be defined as the physiological or psychological response to internal or external pressures. It triggers a cascade of changes throughout the body, influencing how individuals feel and behave [22].

By inducing mind-body changes, stress directly contributes to the development of psychological and physiological disorders, impacting both mental and physical health and ultimately reducing overall quality of life [22].

Studies have demonstrated Qigong's efficacy in reducing stress levels across diverse populations. It has been shown to benefit not only the general population [23] but also individuals in high-stress occupations, such as computer operators [24]. Furthermore, Qigong has been found to alleviate stress associated with specific health conditions, including hypertension [25] and chronic neck pain [26].

Furthermore, research suggests that certain types of prolonged work postures combined with mental stress can lead to sustained activation of low-threshold motor units in the neck and shoulder muscles, resulting in metabolic overload [27-29]. In oral health, alongside stress, posture is closely related to the development of bruxism [30], temporomandibular disorders [31] and other occlusal problems [32].

Qigong has been associated with postural improvements [33-35], which may contribute to pain management. In fact, evidence suggests that the practice of Qigong can produce improvements regarding cervical pain [26,36]. These benefits on pain and biomechanical function may still be observed at 6- and 12-months post-assessment [37].

In another study [38], a Qigong intervention has been shown to improve neck mobility, prevent reduced mobility of the temporomandibular and shoulder joint, and reduce sleep problems in surviving patients of nasopharyngeal cancer.

Also, a recent systematic review [39] suggests that Qigong may be a promising approach to improving joint mobility and alleviating trismus.

Through improvements in posture, pain and alleviation of stress, Qigong may be regarded as a promising beneficial therapeutic tool to improve biomechanical disturbances that are related to oral health.

**3. Sleep, fatigue, anxiety and depression**

Sleep, fatigue, anxiety, and depression are interconnected factors that significantly impact overall health and well-being [40]. When sleep is disrupted, fatigue sets in, affecting energy levels, mood, and productivity [41]. Chronic fatigue can exacerbate anxiety and depression, leading to a vicious cycle. Anxiety and depression, in turn, can disrupt sleep patterns, further compounding the issue [42].

The results of the study by Asawa *et al.* [43] suggest that disturbed sleep, fatigue, and a lack of vitality are interconnected and can significantly impact oral health. In agreement, the study by Rovas *et al.* [44] found that oral health behaviours tend to decline when individuals experience higher levels of stress, fatigue, and sleep disturbances.

Several studies have been conducted to understand the benefits of Qigong on sleep quality. The practice has been shown to have effects on psychological well-being, improving sleep duration [45] and the quality of sleep [46-49] in the general population, but also under specific conditions such as in patients with chronic fatigue syndrome [49], radiotherapy treatment for prostate cancer [50], adults with cognitive impairment [46], Parkinson's disease [48], and in premenopausal women [47].

In addition to these benefits, Qigong also has positive effects in situations related to fatigue [51,52], anxiety [53,54], and depression [49,55,56], promoting a better quality of life [57]. According to Rodrigues *et al.* [58], as a traditional mindfulness cognitive-behavioural therapy, Qigong may allow the users to learn new neuro-vegetative patterns that can model physically disturbed sensations (produced by psychological stress as an example), promoting the learning and modelling of new cognitive processes and patterns.

Through improvements in sleep, fatigue, anxiety, and depression levels, qigong is suggested to improve oral health behaviours. However, specific studies are needed to observe this relation.

**4. For dental medicine professionals**

Dental medicine professionals frequently encounter occupational challenges that can significantly impact their health and well-being. These challenges include prolonged static postures, repetitive movements, and exposure to ergonomic stressors, which can contribute to musculoskeletal disorders, chronic fatigue, and even burnout. These occupational hazards can have a detrimental impact on the physical and mental health of these professionals [59].

As previously discussed, Qigong demonstrates potential in addressing postural imbalances, as evidenced by studies showing improvements in posture [33-35]. This can translate, for example, to effective management of cervical and lumbar pain [60]. Moreover, Qigong may serve as a preventive measure for work-related injuries by enhancing overall body biomechanics and flexibility [37].

Furthermore, considering the potential psychological impact of the dental profession, Qigong may offer valuable benefits in managing stress-related issues such as anxiety and depression [49,53-56]. Notably, studies with other healthcare professionals have demonstrated Qigong's effectiveness in mitigating burnout symptoms [61,62] and improving sleep quality [63].

A study by Malloy *et al.* [64] involving dental hygienists found that mind-body practices like Tai Chi and Qigong were among the most frequently utilized complementary therapies to address work-related musculoskeletal disorders. Importantly, this research concluded that the use of such therapies, including Qigong, positively impacted both physical and psychological quality of life.

**5 - Discussion**

This review explored the potential applications of Qigong in dental medicine, focusing on its impact on stress, posture, musculoskeletal pain, and overall well-being for both patients and dental professionals. The evidence suggests that Qigong offers promising benefits in several key areas relevant to dental health. As stress is a significant contributor to various oral pathologies, including temporomandibular dysfunction, orofacial pain, and bruxism [65,66], the stress-reducing effects of Qigong, demonstrated by reductions in ACTH and increases in β-endorphins [67], could be particularly valuable. Furthermore, the emphasis on breath control in Qigong practice may positively influence conditions linked to dysfunctional breathing patterns, such as dry mouth, dental cavities, periodontal disease, and even craniofacial development [68,69]. These benefits extend to dental professionals, who often experience work-related stress and musculoskeletal issues. Qigong's potential to improve posture [33-35] and alleviate musculoskeletal pain [26,36] could be particularly beneficial in mitigating occupational hazards faced by dental professionals. The observed improvements in sleep quality [46-50] and reductions in fatigue, anxiety, and depression [49,51-56] further support the potential of Qigong to enhance overall well-being, which can indirectly influence oral health behaviors [43,44].

While the mechanisms underlying Qigong's effects are still under investigation, research suggests that mind-body exercises like Qigong can induce structural and functional changes in the brain, particularly in areas associated with cognitive control and emotional

regulation [70]. This may explain the observed improvements in stress management, mood, and overall well-being.

Despite the promising findings, this review is limited by the scarcity of research specifically examining the application of Qigong in dental medicine. This gap in the literature makes it difficult to draw definitive conclusions about the specific effects of Qigong on oral health outcomes and its optimal implementation in dental settings. Furthermore, the quality of existing studies varies, with some exhibiting methodological limitations such as small sample sizes and lack of control groups. Future research, including well-designed randomized controlled trials with larger samples, is crucial to address these limitations and rigorously evaluate the efficacy and safety of Qigong in dental medicine. Investigating different Qigong styles and their specific effects on various aspects of oral health and occupational well-being in dental professionals would also be valuable.

## 6. Conclusions

The discussion presented in this review demonstrates that Qigong can be a valuable addition to dental practice. The benefits observed in previous studies, such as stress reduction, posture improvement, and pain relief, suggest that Qigong can be used to manage stress-related oral health issues and address occupational hazards faced by dental professionals. The evidence indicates potential benefits for stress reduction, posture improvement, pain management, and enhanced psychological well-being, all of which can positively impact oral health and professional performance. However, due to the limited availability of specific research in this area, further rigorous investigation, including randomized controlled trials, is necessary to fully elucidate the effects of Qigong in dental medicine and to develop evidence-based recommendations for its integration into clinical practice.

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*Review*

# Framing the Potential Benefits of Traditional Chinese Exercises for the Management of Patients with Knee Osteoarthritis – A Narrative Review.

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**Abstract:** Background: Knee osteoarthritis (KOA) is a prevalent chronic degenerative joint disease, causing significant pain and functional limitations, impacting quality of life. Traditional Chinese Exercises (TCEs) are increasingly explored as complementary therapies. This narrative review aims to frame the potential benefits of TCEs for KOA management.
Methods: Database search was conducted to find relevant studies on the topic and according to the study's objectives. Guidelines and relevant studies were reviewed to assess the impact of TCEs on physical function, pain, and psychological well-being.
Results: TCEs have demonstrated significant benefits in improving balance, flexibility, and muscle strength, crucial for KOA management. Tai Chi has been shown to reduce pain and improve physical function, self-efficacy, depression, and health-related quality of life. Qigong has also been associated with pain reduction, enhanced psychological well-being, improved knee joint proprioception, postural stability, and reduced stiffness and functional impairments. TCEs offer a holistic approach by integrating physical, mental, and emotional benefits, aligning with recommendations from organizations like the American College of Rheumatology (ACR).
Conclusions: TCEs represent a valuable complementary therapy for KOA, offering a holistic and non-pharmacological approach to pain management and improved quality of life. Integrating these practices into mainstream clinical settings could empower patients to actively manage their KOA symptoms. Further high-quality randomized controlled trials are needed to standardize protocols and optimize the integration of TCEs within Western healthcare systems.

**Keywords:** Knee Osteoarthritis; Traditional Chinese Exercises; Tai Chi; Qigong; Pain Management; Complementary Therapy.

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## 1. Background

Osteoarthritis (OA) is a chronic disorder characteristic of aging, and it is the most common chronic joint disease, lacking effective resources to delay its progression. It can manifest in joints of any size, with the knee being the most affected joint in men and women over 60 years old[1]. Globally, OA is estimated to affect about 7.6% of the population, particularly prevalent in knee and hip joints, with these numbers expected to rise sharply by 2050[2]. In the systematic analysis of the Global Burden of Disease published in 2020[3], OA affects approximately 527.81 million people worldwide, with the knee accounting for 60.6% of the OA burden[3,4]. In Portugal, according to the Instituto Português de Reumatologia (IPR), OA is a significant public health problem, representing the most common rheumatic disease and the leading cause of chronic pain. It accounts for about

30–40% of outpatient rheumatology consultations[5]. The Liga Portuguesa Contra as Doenças Reumáticas (LPCDR) confirms these findings and adds that knee OA affects 12.4% of the Portuguese population, followed by hip OA with 8.7% and hand OA with 2.9% prevalence[6].

The knee joint comprises the distal end of the femur, the proximal end of the tibia, the patella, cartilage (meniscus and articular cartilage), ligaments, the infrapatellar fat pad (IFP), and the synovial membrane. The synovial membrane produces synovial fluid, which nourishes and lubricates the cartilage. Cartilage, such as that covering the femur and tibia, is composed of 70% water, extracellular matrix components—primarily type II collagen and proteoglycans like aggrecan—and chondrocytes. These cells detect mechanical stress and changes in the extracellular matrix, including inflammatory mediators. In response to mechanical or inflammatory stimulation, there is an increase in the activity of aggrecanase, collagenase, and other metalloproteinases, leading to cartilage degradation, which becomes irreversible when collagen network integrity is compromised. The knee joint is subject to significant mechanical stress, contributing to an increased risk of OA development[7].

In OA, changes are not limited to the gradual disappearance of cartilage associated with chondrocyte loss and extracellular matrix modification; subchondral bone remodelling also occurs. The subchondral bone contains blood vessels within vascular channels that house osteoblasts and sensory nerves, facilitating biochemical communication between bone and cartilage. Inflammatory mediators produced by chondrocytes in response to various stimuli act as paracrine factors, initiating a vicious cycle of cartilage degradation, reaching the synovial fluid, and triggering joint inflammation. This damages the cartilage and induces changes in adjacent joint tissues[7]. The inflammatory mediators involved in OA, upon reaching the sensory nerve endings in vascular channels, elicit nociceptive perception, manifesting as tibiofemoral pain[8]. The IFP and synovial membrane can be considered a morpho-functional unit due to their close contact, as the adipose tissue in the IFP secretes adipokines that influence the joint. Similarly, knee joint inflammation may be associated with increased inflammation and fibrotic changes in the IFP[9,10].

Cartilage is a highly specialized connective tissue, and its damage is the hallmark of OA. The main risk factors for OA include aging, female gender, overweight/obesity, metabolic syndrome, joint trauma, genetic predisposition, and occupational load[11,12]. Preventing OA involves reducing risks from childhood through public health campaigns, focusing on high-risk groups such as athletes. Addressing both internal risk factors (e.g., obesity and genetics) and external ones (e.g., joint injuries) is crucial, with priority given to obesity and sports injuries, particularly at specific life stages[13]. Preventing OA is challenging as it incurs costs and interferes with cultural and dietary habits. Strengthening exercises reduce joint injuries but have low adherence due to a lack of motivation, emphasizing the importance of education about OA's consequences on quality of life and well-being as an incentive for lifestyle changes[12].

### *1.2. Knee Osteoarthritis management*

Knee Osteoarthritis (KOA) is incurable, therefore therapeutic goals include pain control, increased mobility, and improved well-being[14]. KOA treatment must integrate symptoms affecting physical conditions, such as pain and functional limitations, with psychological factors, including anxiety, depression, and sleep pattern disruptions. The therapeutic plan for KOA may involve various interventions: surgical, pharmacological, psychosocial, and those promoting general well-being (e.g., stress reduction, mood improvement, sleep regulation, weight control, and enhanced physical condition). These may be implemented individually, sequentially, or in combination. Determining the best KOA treatment requires considering the patient's overall health status, including comorbidities (e.g., hypertension, cardiovascular disease, heart failure, digestive bleeding risk, chronic kidney disease), as well as the patient's beliefs and preferences[15]. KOA treatment should

begin with non-surgical interventions, potentially progressing to surgical treatments if pharmacological and non-pharmacological therapies prove clinically ineffective[14].

Weight loss, improved motor control, and low-impact exercise are the primary goals of conservative KOA treatment, improving physical fitness, quality of life, and reducing OA-associated pain[14,16]. Weight control is particularly important, as there is a positive correlation between weight loss and symptom improvement or functionality in OA patients. A reduction of ≥5% in body weight is associated with clinical improvement, with clinical benefits increasing with reductions of 5–10%, 10–20%, and >20% in body weight. The effectiveness of weight loss in treating OA symptoms is enhanced by the concurrent implementation of an exercise program[17].

Conventional non-surgical or conservative KOA treatments

Conventional non-surgical or conservative KOA treatment includes physiotherapy and pharmacological therapies. Physiotherapy encompasses therapeutic exercises aimed at increasing muscle strength and endurance, providing greater stability, reducing pain and inflammation[18], and improving joint and muscle range of motion[15]. Supervised KOA treatment by a physiotherapist is crucial for adherence, as these professionals assist with exercises, use orthopaedic materials, and perform thermal therapies, among other interventions[15] . Therapeutic exercises include walking, stationary biking, water aerobics, isokinetic weight machines, resistance bands, isometric exercises, and balance exercises [15]. KOA patients experiencing pain, stiffness, and swelling require pharmacological treatment, whether topical, injectable, or oral. All medication therapy aims solely to treat symptoms, aiding in patient mobility control[14]. Pharmacological treatment can be classified into two major groups: fast-acting medications and slow-acting medications, including structure-modifying drugs. Medication therapy should be complemented by non-pharmacological therapies, such as physical exercise[16]. Nonsteroidal anti-inflammatory drugs (NSAIDs) aim to control inflammation and provide analgesia for KOA patients. Topical formulations are preferred over oral ones, as they present fewer side effects in patients with multiple comorbidities. However, when topical formulations do not control pain, oral formulations may be considered for moderate to severe pain under medical evaluation. NSAIDs prescriptions should always be tailored to the patient, with treatment monitored to avoid adverse effects, and the lowest effective dose should be used for the shortest necessary duration. For patients in whom NSAIDs are contraindicated, glucocorticoid injections offer highly effective short-term KOA treatment. Similarly, tramadol or other opioids are alternative treatments to NSAIDs. Disease-modifying anti-rheumatic drugs, such as methotrexate, are recommended for KOA patients, helping control disease symptoms[15]. Biological therapy implemented intra-articularly, using FDA and EMA approved drugs, is another option for KOA treatment. Hyaluronic acid, a naturally occurring substance in synovial fluid, contributes to pain relief, stimulates synovial fluid production, and promotes cushioning and lubrication of joint surfaces. This therapy is increasingly used as it seeks to delay surgical intervention, being administered in a concentrated dosage directly into the affected joint with minimal side effect risk. Other therapies, such as intra-articular injections of platelet-rich plasma, stem cells, dextrose prolotherapy, and genicular nerve block, are also employed as adjuncts in KOA treatment, aiming to reduce pain, swelling, and improve joint function[14]. Orthopedic devices and materials, such as lateral wedge insoles, canes, and knee braces, are recommended for KOA patients[14,15]. The lateral wedge insole contributes to pain relief and improves the functional state of the joint[14]. The use of canes is recommended for KOA patients when the disease compromises walking, joint stability, or causes pain. Tibiofemoral knee braces are recommended for KOA patients if the disease significantly impairs joint mobility and stability, and the patient can tolerate the discomfort and load associated with the orthosis[15].

Surgical KOA treatments

Patients with KOA who experience significantly compromised quality of life and for whom conservative treatment fails to alleviate pain or improve joint movement should be considered candidates for surgical treatment. Various types of surgery, such as arthroscopy, arthroplasty, and osteotomy, aim to improve the quality of life for OA patients. It is important to note that different techniques have limitations and risks. For example, arthroscopic surgery may not be more effective than conservative treatments such as physiotherapy. Knee arthroplasty (total or partial replacement) is recommended for advanced KOA cases, especially in elderly patients, as it effectively alleviates pain and improves joint function, though it may have significant side effects. Osteotomy is another surgical option to reduce the need for joint replacement in younger KOA patients. This procedure redistributes the load to the healthy compartment of the knee, preserving its function. It is most effective in early-stage KOA patients under 50 years of age with partially preserved cartilage. However, the success of the procedure may be influenced by factors such as the patient's weight[14].

Complementary therapies for KOA

Conservative therapeutic approaches for KOA patients extend beyond conventional treatment. It is also included in a broad and diverse set of treatments that can be applied alternatively or complementarily with Western Medicine (WM). Mud therapy is a safe and cost-effective approach to treating KOA, promoting recovery through the heat and minerals present in the mud, alleviating pain, and improving function. The local application of mud can be an effective complementary therapy for OA treatment, offering pain relief and additional benefits to the patient's well-being[19]. According to the recommendations issued in 2019 by the American College of Rheumatology/Arthritis Foundation for the Management of Osteoarthritis of the Hand, Hip, and Knee, participation in self-efficacy and self-management programs may help KOA patients. These programs use a multidisciplinary format with the goals of helping patients set goals, solve problems, encourage positive thinking, educate them about the disease and medication side effects, provide joint protection measures, and address fitness and exercise approaches[15]. Cognitive-behavioral therapy (CBT) is indicated for chronic pain conditions, benefiting KOA patients by relieving pain, improving quality of life, mitigating negative mood states, alleviating fatigue, enhancing functional capacity, and reducing disability[20,21]. Yoga is a mind-body practice rooted in ancient Indian philosophy and typically combines physical postures, breathing techniques, and meditation or relaxation. Although much less studied than Tai Chi, Yoga can be helpful in KOA through a similar combination of physical and psychosocial factors[15].

While WM focuses on symptom management through pharmacologic and surgical interventions, Traditional Chinese Medicine (TCM) emphasizes holistic, energy-based approaches, encompassing acupuncture, moxibustion, herbal medicine, and massage. TCM has been used for millennia in China to treat various pathological conditions, especially chronic pain[22]. It is frequently applied in KOA treatment[22], providing symptom relief with minimal adverse reactions and high applicability for patients with comorbidities[23]. According to the TCM Diagnostic and Treatment Guide for Knee Osteoarthritis (2020), KOA can be classified into five types: Qi stagnation and blood stasis, damp-heat obstruction, cold-damp obstruction, liver and kidney deficiency, and Qi and blood weakness[24]. In TCM theory, KOA is considered a form of "bone obstruction" or "Bi disease," where "evil spirits" penetrate the bone marrow, exacerbating symptoms. TCM aims to restore joint functions, reduce pain, and improve mobility to treat KOA effectively[25]. Chinese herbal medicine plays a significant role in KOA treatment, with several plants demonstrating recognized therapeutic benefits in both TCM and WM. Commonly used plants include Dipsacus asper Wall. ex-Henry, Chaenomeles sinensis (Thouin) Koehne, Rhizoma Polygoni Cuspidati, Achyranthis Bidentatae Radix, Eucommia ulmoides Oliv., Paeoniae

Radix Alba, Angelica sinensis, and Curcuma longa L [23]. Herbal formulas combining various plants are preferred over isolated use, providing more balanced and effective actions while reducing toxicity associated with certain substances[23]. Widely used compounds include Yougui Wan, Duhuo Jisheng Decoction, and Simiao Wan [23]. Registered Chinese medicines for KOA treatment include Wangbi tablets, Xianling Gubao capsules, Duhuo Jisheng tablets, Jintiange capsules, and Longbie capsules, among others. These medicines have shown remarkable effects in treating KOA[23]. Topical application of Chinese herbal pastes, moxibustion, and heat on the affected area have significant therapeutic effects, as they help warm the meridians, disperse pernicious Qi, promote blood circulation, cellular metabolism, lymphatic drainage, and alleviate inflammation[23]. Acupuncture, a widely used TCM technique globally, is recognized as an effective and safe therapy for pain relief, suitable for various types of musculoskeletal pain, including pain and functional recovery in KOA patients[26–29], It may offer greater efficacy and fewer adverse reactions compared to WM treatments [30,31]. TCM also includes exercises applicable for both prevention and treatment: TCEs, the most studied of which is Tai Chi. Tai Chi offers similar benefits to physiotherapy in pain relief and improved physical function, with the added advantages of reducing depression symptoms and improving quality of life. TCEs have similar benefits to physical therapies, being low-to-moderate intensity and focusing on coordinating breathing and body movement[32]. TCEs have evolved over thousands of years into a distinctive system that integrates physical movement, meditative stillness, and philosophical principles to promote health and prevent disease. Guided by concepts such as the Yin-Yang doctrine, the Five Elements theory, and the meridian Zang Fu organ framework, TCEs aims to regulate Qi and blood, unblock energy pathways, and enhance physical and mental well-being. These practices harmonize gentle movements with muscle stretching, controlled breathing, and mental focus, forming a holistic approach that has gained global recognition[33–35]. Numerous studies underscore the benefits of TCEs for a wide range of medical conditions, including cardiovascular, respiratory, musculoskeletal, and endocrine disorders, as well as balance issues. Renowned organizations like the Osteoarthritis Research Society International (OARSI) and the American College of Rheumatology (ACR) endorse these exercises as safe and effective non-pharmacological interventions. Among the most popular forms of TCEs are Tai Chi, Qigong, Baduanjin, Yijinjing, and Wuqinxi[36].

Tai Chi: This traditional martial art is characterized by slow, controlled movements combined with deep breathing, often described as "meditation in motion." Tai Chi enhances physical health, mental clarity, and spiritual balance through fluid postures requiring focus and control. Studies demonstrate its effectiveness in improving mindfulness, reducing anxiety, and increasing pain tolerance[33].

Qigong: Combining movement, breath control, and meditation, Qigong aims to cultivate and balance qi. It is particularly suitable for older adults with chronic conditions, improving cardiovascular health, immune function, and mental clarity. Variants like the "White Ball" system provide clinical benefits in just 5–6 minutes of practice daily, as observed through studies using infrared thermography[37–39].

Baduanjin: Known as the "Eight Pieces of Brocade," this form of Qigong comprises eight movements designed to enhance flexibility, strength, and qi flow. Research supports its role in improving cognitive function and physiological parameters in various clinical populations[34,36].

Yijinjing: This practice combines dynamic movements with breath control to strengthen muscles and tendons, promoting energy circulation and physical resilience. It also restores balance between the body and mind[34].

Wuqinxi: Also known as the "Five Animal Frolics," this exercise mimics the movements of animals such as the tiger, deer, and bird. Designed by the renowned physician Hua Tuo, it improves flexibility, strength, and energy circulation. A simplified version is widely practiced in modern China[37].

## 2. Health Benefits of TCEs

TCE serves as a complementary therapy to enhance blood circulation, regulate organ functions, and activate muscles and tendons through coordinated movements, breathing, and meditation[33,34,36,39,40].

Physical benefits: Tai Chi improves balance, flexibility, and muscle strength, offering effective interventions for older adults and individuals with chronic conditions. Its integration of movement and breath helps reduce joint strain and enhances lower limb strength [40]. Mental and emotional benefits: practices like Qigong and Tai Chi induce relaxation and mental clarity, reducing stress and anxiety while promoting emotional resilience. Studies indicate these exercises foster natural pain relief by enhancing circulation and releasing endorphins[36]. Integration of movement and breath: exercises such as Yijinjing and Baduanjin emphasize the synchronization of physical movement with controlled breathing, improving physiological functions and restoring energy balance. Baduanjin has been particularly effective in addressing psychological and physiological challenges, such as chronic fatigue syndrome and Parkinson's disease[37].

### *2.1. Effects of TCEs on Musculoskeletal Disorders*

TCE has demonstrated significant benefits in improving balance, flexibility, and muscle strength, making it highly effective for individuals with musculoskeletal conditions[33,35]. Joint health: studies reveal improvements in knee joint function and reduced inflammatory markers, offering natural pain relief and improved mobility[33,35]. Lubrication and flexibility: the low-impact movements inherent to these exercises stimulate joint lubrication, reduce stiffness, and enhance physical endurance, providing long-term benefits for joint health[33,35].

### *2.2. Benefits of TCE in Osteoarthritis*

TCEs, including Tai Chi, Qigong, Baduanjin, Yijinjing, and Wuqinxi, have been increasingly recognized for its therapeutic potential in addressing musculoskeletal disorders[34,35,37]. Evidence-based benefits: high-quality randomized controlled trials have shown that TCEs significantly reduces pain, improves physical function, and alleviates inflammation in individuals with KOA. Tai Chi is recommended by the ACR guidelines since 2019 and exemplifies the global application of these practices[34]. Moreover, Tai Chi is directly associated to improvements in pain[41–43], physical function, self-efficacy, depression, and health-related quality of life[43] in OA patients. On the other hand, Qigong also is associated with improvements in pain[44,45], psychological well-being (reduced stress, anxiety, depression, and mood disturbance), as well as improvements in knee joint proprioception and postural stability, reduction of stiffness and functional impairments[45] in KOA patients.

TCEs may serve the so needed holistic approach by combining physical, mental, and emotional benefits, offering a comprehensive approach to managing KOA. This holistic strategy not only enhances patients' quality of life but also underscores the value of non-pharmacological interventions in modern healthcare[36].

## 3. Final Remarks

This review has examined the growing body of evidence supporting the efficacy of TCEs for pain management in patients with KOA. Current evidence supports that TCEs, including Tai Chi, Qigong, Baduanjin, Yijinjing, and Wuqinxi, promote pain control and improve physical function. The multifaceted benefits of TCEs extend beyond physical improvements, encompassing mental and emotional well-being, providing patients with sustainable methods for improving their quality of life.

While the evidence is compelling, further high-quality research, particularly randomized controlled trials, is warranted to explore the long-term effects of TCEs on KOA. Future studies should also focus on standardizing exercise protocols and tailoring interventions to individual patient needs and preferences.

TCEs represent a potentially valuable complementary therapy for KOA, bridging ancient wisdom with modern healthcare practices. By informing healthcare providers, institutions, and policymakers about the potential applications of TCEs, the integration of these practices into conventional clinical settings could improve the patient's quality of life.

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*Review*

# Efficacy of Acupuncture in the Symptoms of the Carpal Tunnel Syndrome: Assessment of Efficacy and Methodologies.

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**Abstract:** Carpal Tunnel Syndrome (CTS) is a compressive neuropathy of the median nerve at the wrist, most prevalent in adults aged 40 to 60, predominantly affecting women. Characterized by symptoms such as tingling, pain, and numbness in the upper extremities, CTS negatively impacts quality of life and work capacity. Conventional therapies—both surgical and conservative—have limitations, underscoring the need for a multidisciplinary approach.
This study explores acupuncture's role in CTS management from the perspective of Traditional Chinese Medicine (TCM). In TCM, CTS is viewed as a Painful Obstruction (*bi*) Syndrome related to external factors—wind, cold, and dampness. Pathologically, CTS arises from stagnation of *Qi*, Blood, and Phlegm, often coupled with deficiencies in *Qi*, *Yin*, *Yang*, or Blood.
Literature reviews and clinical trials support acupuncture's efficacy in pain relief and symptom improvement. Acupoint selection (e.g., PC 7, PC 6) is grounded in TCM theory to restore energetic balance and enhance circulation. Complementary *Tuina* massage further reduces inflammation and promotes mitochondrial biogenesis.
Although evidence is promising, further high-quality studies are needed to consolidate acupuncture's benefits in CTS. Integrative approaches combining acupuncture and *Tuina* present a valuable alternative for improving functionality and quality of life in CTS patients, offering symptomatic relief and potentially reducing reliance on conventional treatments.

**Keywords:** Carpal tunnel syndrome; Traditional Chinese Medicine; Acupuncture.

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## 1. Background

CTS is a compressive neuropathy of the median nerve at the wrist and is the most common entrapment neuropathy [1]. It predominantly affects adults between 40 and 60 years old, is five times more common in women than in men, and is very rare in children [2]. CTS manifests as symptomatic compression of the median nerve, with primary symptoms of tingling, pain, and/or numbness in the areas innervated by that nerve—the thumb, index, middle finger, and radial half of the ring finger—as well as reduced strength and function of the affected hand [3].

Common conservative treatments include local corticosteroid injections, musculoskeletal manipulation, and immobilization [4]. However, corticosteroid injections provide limited long-term benefit—approximately three-quarters of patients require surgery within one year [5], and evidence for splinting's effectiveness is inconclusive [6].

Surgical release of the transverse carpal ligament remains the most definitive intervention to alter the relationship between the median nerve, tendons, and carpal tunnel [4]. Yet surgery carries risks of nerve, arterial, or tendon injury; complex regional pain syndrome; scarring; transient neuropraxia; and potential reoperation [7,8].

Given conventional therapies' limitations and CTS's impact on an active population, there is a critical need for therapeutic options that offer durable symptom relief.

TCM is a holistic medical system that understands health as a state of cooperative functioning among biological systems, which can be negatively affected when disrupted [9]. Currently, the evidence base for TCM supports its use as part of integrative medicine, offering a potentially beneficial approach when incorporated into healthcare systems by enhancing clinical outcomes, patient quality of life, and access to care [9].

Acupuncture, as a TCM technique, is defined by the insertion of fine needles at specific points or areas of the body [10]. Its aim is to promote an enhanced state of well-being through regulation of the nervous, circulatory, endocrine, and exocrine systems [11]. Although the mechanisms of acupuncture remain incompletely understood [12], its benefits extend across numerous areas of human health including mental health [9,13,14], gastrointestinal disorders [15-18], gynecological conditions [19-21], and pain management [22-24], among many others [25-33].

Accordingly, the primary objective of this study is to elucidate the effects of acupuncture in the treatment and management of CTS. We also examine CTS through the lens of TCM and outline the specific therapeutic approaches employed in acupuncture.

## 2. Traditional Chinese Medicine and Acupuncture in Carpal Tunnel Syndrome

### *2.1. Carpal Tunnel Syndrome from the TCM Perspective*

In TCM, CTS falls under the category of Painful Obstruction Syndromes (*bi*). "bi" signifies blockage causing pain, numbness, or sensitivity in muscles, tendons, and joints, and is attributed to invasion by external Wind, Cold, or Dampness [34].

Chronic *bi* may involve stagnation of *Qi*, Blood, and body fluids; development of Phlegm; and ultimately Blood stasis, further impeding circulation and intensifying pain.

However, according to Fredes et al. [35], Classical TCM texts describe six pathological causes of paresthesia, ranging from nerve impulse transmission failure to chronic injury and *Qi*/Blood deficiency, each correlating with specific citations in the Huangdi Neijing (Inner Canon of the Yellow Emperor). These can be observed in Table 1.

**Table 1.** Reasons for the Appearance of Paresthesia. Adapted from Fredes et al. [35].

| | | |
|---|---|---|
| **Failure in the transmission of nerve impulses.** | Failure in the movement of defensive energy. | *"Puncture for the regulation of the genuine and the evil. In: Gan ZW, Wang XY, editors. The spirit axis of the inner canon of the divine Yellow Emperor. Beijing: Xue Yuan Press; 2016. p. 183."* [36] |
| **Poor nutrition and failure in blood irrigation.** | "When the nutritive *Qi* is empty, there is numbness." | *"Discussion of the inverted regulation. In: Gan ZW, Wang XY, editors. The spirit axis of the inner canon of the divine Yellow Emperor. Beijing: Xue Yuan Press; 2013. p. 164."* [37] |
| **Chronic injury to the nervous and circulatory systems.** | "When there is no pain, but there is swelling, the disease has remained and deepened. The circulation of nutritive and defensive *Qi* is rough, and the channels and collaterals occasionally relax. In this way, they are obstructed. There is a lack of nutrition in the skin. Thus, there is numbness." | *"Discussion of block [disease]. In: Gan ZW, Wang XY, editors. The spirit axis of the inner canon of the divine Yellow Emperor. Beijing: Xue Yuan Press; 2013. p. 207."* [38] |
| **Neurasthenia.** | "When the body is frequently frightened and fearful, the tendons and vessels are obstructed, generating numbness." | *"Discussion of the nine needles. In: Gan ZW, Wang XY, editors. The spirit axis of the inner canon of the divine Yellow Emperor. Beijing: Xue Yuan Press; 2016. p. 194."* [39] |
| **Diabetes.** | "When there is heat in the *Qi* of the Spleen-pancreas, the stomach dries out, and there is | *"Discussion of atrophy [disease]. In: Gan ZW, Wang XY, editors. The spirit axis of the inner* |

| | | |
|---|---|---|
| | thirst. There is numbness in the muscles and flesh, manifesting as flesh atrophy." | *canon of the divine Yellow Emperor. Beijing: Xue Yuan Press; 2013. p. 208."* [40] |
| **Prolonged contraction from cold.** | "When cold and *bì* (blockage) become diseases and are retained without being eliminated, there is occasionally pain and numbness in the skin." | *"Longevity, die early and the strong and the soft. In: Gan ZW, Wang XY, editors. The spirit axis of the inner canon of the divine Yellow Emperor. Beijing: Xue Yuan Press; 2016. p. 24."* [41] |

Moreover, tendinous atrophy (including nerves) may arise from inflamation (Heat) and inadequate nutrition (Dryness), with specific channel involvements (*Tai Yin, Yang Ming*, *Jue Yin* of the hand) detailed in classical sources [35].

In the case of neuropathies, nerve damage is precisely described as a "tendon injury" (as one of the "Five Bodies" (**五體** *wǔ tǐ*) – tendons and membranes). Table 2 presents the reasoning of Fredes et al. [35] regarding the development of tendon atrophy and neuropathies associated with CTS.

**Table 2.** Development of Tendon Atrophy and Neuropathies Associated with CTS According to TCM. Adapted from Fredes et al. [35].

| | | |
|---|---|---|
| **Tendon Atrophy – Heat and Dryness** | "When there is heat in the Liver *Qi*, the Gallbladder drains, the mouth is bitter, and the tendons and membranes dry out. When the tendons and membranes dry out, the tendons become tense and contract, manifesting as tendon atrophy" | *"Discussion of atrophy [disease]. In: Gan ZW, Wang XY, editors. The spirit axis of the inner canon of the divine Yellow Emperor. Beijing: Xue Yuan Press; 2013. p. 208."*[40] |
| **Neuropathies – Tendon Injury (tendons in classical Chinese medicine = Connective, muscular, and nervous tissues or tendino-muscular channels)** | Possible injury in:<br>Tai Yin channel of the hand (lung)<br>Yang Ming channel of the hand (large intestine)<br>Jue Yin channel of the hand (pericardium) | *"The tendons of the channels. In: Gan ZW, Wang XY, editors. The spirit axis of the inner canon of the divine Yellow Emperor. Beijing: Xue Yuan Press; 2016. p. 51."* [42] |

*2.2. Acupuncture for Carpal Tunnel Syndrome*

Regarding the application of acupuncture for CTS, Branco e Naeser [43] conducted a study using several non-pharmacological approaches, including acupuncture and laser therapy. They observed complete pain reduction in 50% of the cases. At the follow-up, 1 to 2 years later, only 2 of the 23 treated hands (8.3%) experienced a recurrence of pain, which resolved quickly within a few weeks of renewed treatment. The authors noted that these results were associated with increased blood flow to the brain, particularly to the thalamus. Possible mechanisms identified include increased cellular adenosine triphosphate (ATP), reduced inflammation, and a temporary rise in serotonin levels.

Similarly, Yang *et al.* [44] compared the effects of acupuncture using Pericardium 5 and Pericardium 6 points in the treatment of CTS with oral prednisolone. They found that by the end of the treatment period, improvements were similar in both groups, except for the symptom "waking during the night due to symptomatology," which showed more significant improvement in the acupuncture group.

In line with this, Cai [45] conducted a study to investigate the effectiveness of acupuncture combined with *Tuina* massage in 98 patients with CTS. The results showed that acupuncture together with *Tuina* manipulation produced highly significant therapeutic effects.

Carlson *et al.* [46], in their examination of various non-surgical therapeutic options for managing CTS symptoms, reported that 38% of the American population turned to so-called complementary therapies for pain management.

Evidence supporting the effect of acupuncture in improving CTS symptoms was also noted by Prime *et al.* [47], who found that acupuncture significantly improved the function of the median nerve.

Confirming these findings, Khosrawi *et al.* [48] carried out a controlled, randomized study to assess the efficacy of acupuncture in treating mild to moderate CTS. Patients underwent eight acupuncture sessions, compared to a control group that received four weeks of nighttime hand splinting, vitamin B1 and B6 supplementation, and sham acupuncture. The authors concluded that acupuncture can improve overall subjective symptoms and should be considered in the care plans of these patients. The acupuncture points used in the study were PC 7 and PC 6.

Another study showing positive results with acupuncture in CTS was conducted by Ho *et al.* [49], concluding that acupuncture had a therapeutic effect, particularly in improving symptoms, grip strength, and electrophysiological function.

Furthermore, Hadianfard *et al.* [50] conducted a randomized study involving 50 participants, comparing various therapeutic options for CTS. They found that patients who received acupuncture showed better outcomes in pain reduction compared to those who used ibuprofen. In addition to pain, they also saw greater improvements in tingling and numbness. The acupuncture group also reported fewer nighttime awakenings due to pain or other symptoms related to CTS.

Chung *et al.* [51] also highlighted in their literature review that acupuncture is widely used in Chinese medicine for treating pain and neuropathy. The authors presented results from a 2011 systematic literature review that included two studies comparing acupuncture with local steroid injections. These showed that the acupuncture group had more significant improvements in reducing CTS symptoms compared to those who received steroid injections. They also referenced another randomized study from 2009, which showed that patients treated with acupuncture had better outcomes than those who took low doses of oral corticosteroids.

A recent clinical study by Fredes *et al.* [35] demonstrated that acupuncture can yield significant results in CTS patients, particularly in reducing pain intensity—potentially increasing pressure pain thresholds by an average of 0.682 kgf/cm². Daytime and nighttime paresthesia also improved significantly, as did functional impairments related to decreased strength caused by CTS.

However, referring to the most recent systematic review and meta-analysis by Dong *et al.* [52], the findings were as follows:

Compared to night splinting, acupuncture alone was more effective in relieving pain. However, no significant differences were observed in symptom severity or functional status.

Acupuncture alone may be as effective as medication in improving symptom severity and electrophysiological parameters.

As a complementary treatment, acupuncture may have beneficial effects on symptom severity, functional status, pain intensity, and electrophysiological parameters. When combined with medication, acupuncture showed superior outcomes compared to medication alone.

There is still a lack of high-quality studies to draw definitive conclusions.

Thus, according to these authors, acupuncture has the potential to be beneficial as an adjunct treatment for CTS.

Overall, based on the evidence reviewed in this section, further studies are needed to confirm the beneficial effects acupuncture may offer in treating CTS.

### *2.3. Therapeutic Approach in Acupuncture*

Fredes *et al.* [35], in their clinical study, selected several foundational acupuncture points based on the logic of classical Chinese medicine and aligned with the results previously discussed. Table 3 presents a summary of these:

Table 3. Channels affected in CTS and points applied to all patients

| | |
|---|---|
| **Tai Yin Channel of the Hand** | "Broken Sequence" (LU 7 列缺 *Liè Quē*) |
| **Jue Yin Channel of the Hand** | "Great Mound" (PC 7 大陵 *Dà Líng*) |
| **Yang Ming Channel of the Hand** | "Union of the Valleys" (LI 4 合谷 *Hé Gǔ*) |

In their study, other points were also selected individually for each case, depending on the patient's specific concomitant imbalances. These are shown in Table 4.

Table 4. Concomitant imbalances and applied acupuncture points

| **Imbalance** | **Acupuncture Points** |
|---|---|
| Liver Blood deficiency; Liver *Qi* stagnation | *Qū Quán* (LIV 8), *Dà Dūn* (LIV 1), *Sān Yīn Jiāo* (SP 6) |
| Liver Blood deficiency; Liver *Qi* stagnation; Spleen-Pancreas and Kidney *Qi* deficiency with damp retention | *Qū Quán* (LIV 8), *Dà Dūn* (LIV 1), *Sān Yīn Jiāo* (SP 6), *Tài Bái* (SP 3), *Yīn Líng Quán* (SP 9), *Fù Liū* (KI 7) |
| Liver *Qi* stagnation; Spleen-Pancreas *Qi* deficiency | *Gān Shū* (BL 18), *Tài Chōng* (LIV 3), *Tài Bái* (SP 3), *Yǐn Bái* (SP 1) |
| Liver Blood deficiency and Blood stasis; Spleen-Pancreas *Qi* deficiency | *Qū Quán* (LIV 8), *Dà Dūn* (LIV 1), *Tài Bái* (SP 3), Sān *Yīn Jiāo* (SP 6), Bleeding and cupping at *Gé Shū* (BL 17) |
| Liver Blood deficiency and Blood stasis | Acupuncture and moxibustion at *Qū Quán* (LIV 8);<br>Moxibustion at *Dà Dūn* (LIV 1);<br>Acupuncture and moxibustion at *Sān Yīn Jiāo* (SP 6);<br>Bleeding and cupping at *Gé Shū* (BL 17);<br>Bleeding at *Qū Chí* (LI 11) |

In this study, based on the table above, we observe two main approaches were used: (1) Local — to directly treat the affected area, and (2) Distal — to regulate the underlying syndromes observed in each patient.

In another study by Napadow *et al.* [53], local acupuncture was applied to the affected hand or distally at the ankle. Both approaches improved nerve signaling. However, the advantage of local acupuncture was particularly noted in cortical remapping, which translated into longer-term benefits.

The most recent systematic review mentioned earlier [52] reported the frequency of acupuncture point usage across 16 included studies, as illustrated in Figure 1.

From this data, we can observe that the most frequently used acupuncture point in CTS research is PC 7. In second place, used in 75% of the studies, is PC 6. Third place is held by LI 4 and LI 11, both applied in 50% of the studies.

The anatomical locations of these points, according to the World Health Organization [54], are shown in Figures 2, 3, 4, and 5.

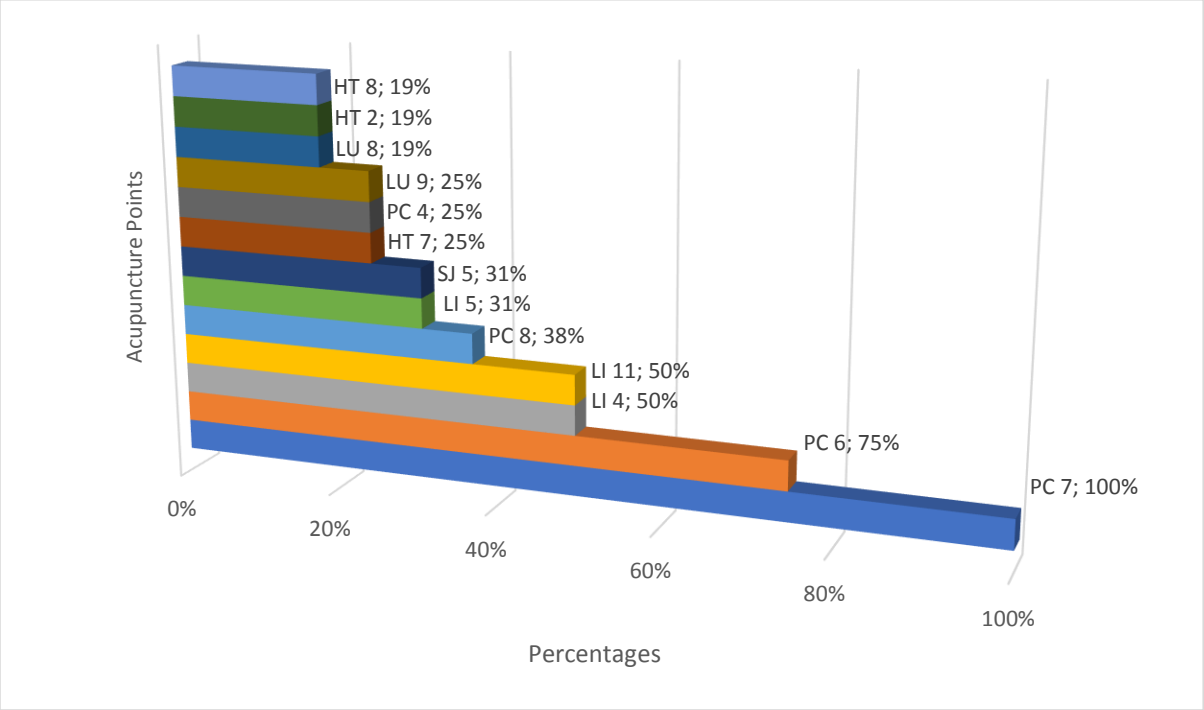


Figure 1. – Frequency of acupuncture point usage according to Dong *et al.* [52].

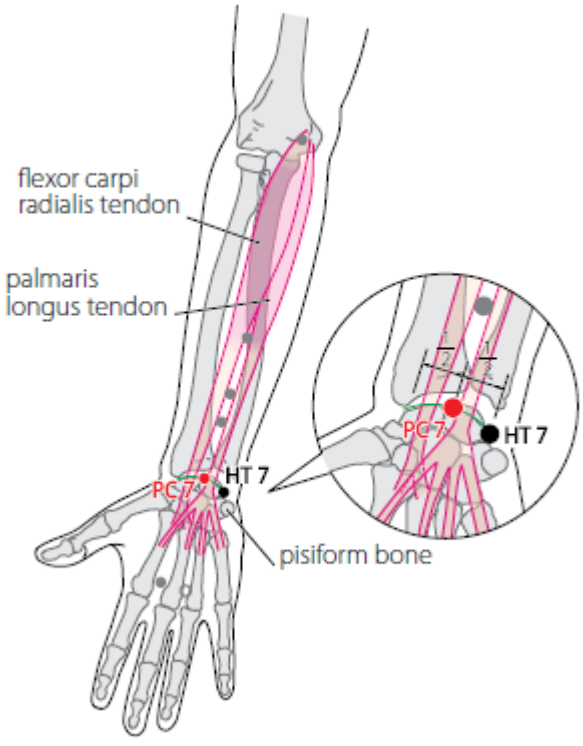


Figure 2. PC 7

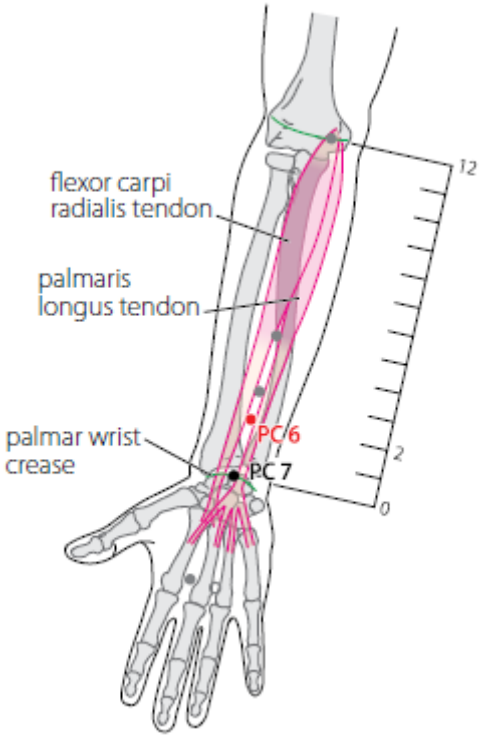


Figure 3. PC 6

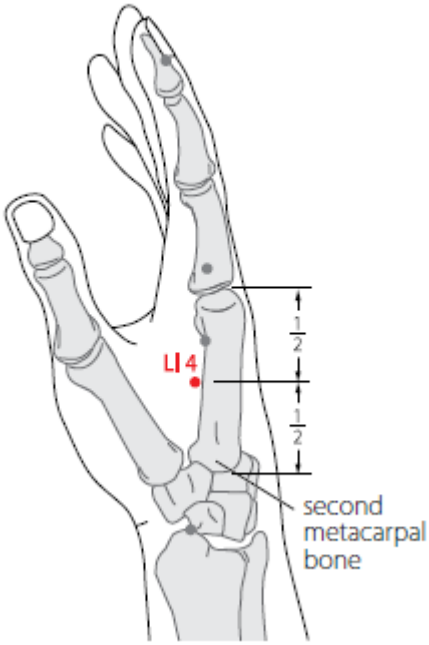


Figure 4. LI 4

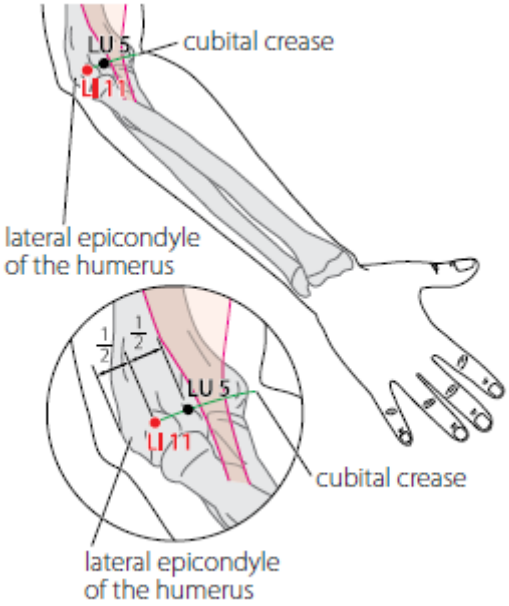


Figure 5. LI 11

*2.4. Acupuncture and Tuina Massage*

The main objective of *Tuina* massage is to remove energy blockages that lead to *Qi* stagnation. This massage aims to increase the circulation of *Qi* and blood and reduce localized edema, which in turn helps relieve pain. The painful area is usually where the energetic and blood blockages are located. Therefore, manipulating these points promotes the free flow of *Qi* and improves blood circulation in the affected region [55]. The authors cite studies showing that one of the mechanisms through which *Tuina* massage provides benefits is by reducing inflammation and promoting mitochondrial biogenesis, which contributes to the repair of damaged skeletal muscle tissue.

To demonstrate the effectiveness of *Tuina* massage in pain reduction, we highlight the findings of Lewis *et al.* [56], who analyzed 20 studies involving a total of 1,341 participants. Their aim was to assess the effect of therapeutic massage on pain control. Nine of these studies were conducted on healthy individuals, where the interventions were intended to reduce post-exercise pain. The remaining 11 studies involved patients with musculoskeletal disorders whose symptoms included pain. Therapeutic massage was shown to be effective in reducing pain in half of these 20 studies. Of the nine studies conducted on healthy individuals, four showed improvement in pain conditions. In the group of patients with musculoskeletal disorders, six studies also reported positive outcomes compared to the control group. However, the authors noted that small sample sizes, poor methodological quality, and short massage duration led them to consider the results inconclusive.

In a separate study, Tsao [57] conducted a systematic review and found that patients with CTS who received *Tuina* massage for four weeks (15 minutes per day) showed improvements in pain, grip strength, anxiety, and depression compared to the control group.

Likewise, Cai [45] carried out a study (previously mentioned in this paper) to evaluate the effectiveness of acupuncture combined with *Tuina* massage in 98 patients with CTS. It

was found that the combination of acupuncture and *Tuina* manipulation had very significant therapeutic effects.

Jiang et al. (2016) confirmed these conclusions in their randomized study involving 98 individuals with CTS, divided into two groups: a treatment group and a control group. The treatment group received acupuncture at specifically selected points followed by *Tuina* relaxation massage, while the control group received conventional pharmacological treatment. The results revealed a statistically significant difference between the groups ($P < 0.01$), with the treatment group achieving a cure rate of 81.7% compared to 47.4% in the control group. This led to the conclusion that acupuncture combined with *Tuina* massage may be a simple yet effective therapy for CTS.

Following the promising findings of the previous studies, a recent study by Chen et al. [58] examined the effects of electroacupuncture combined with *Tuina* on the median nerve conduction velocity and joint motor function rehabilitation in patients with CTS. In this study, the treatment group received electroacupuncture combined with *Tuina*, while the control group received conventional medication. The overall efficacy rate in the treatment group was 95.24%, significantly higher than the control group's 78.57%. Symptom and functional scores in both groups significantly decreased after treatment, with the treatment group showing significantly lower scores than the control group post-treatment.

Furthermore, after treatment, the range of motion for radial deviation, ulnar deviation, dorsal extension, and palmar flexion significantly improved in both groups. Sensory conduction velocity from the thumb and middle finger to the wrist, as well as motor conduction velocity from the thenar muscle to the wrist, also significantly improved in both groups. However, the wrist joint range of motion and median nerve conduction velocity were significantly higher in the treatment group than in the control group. Pain scores in both groups also significantly decreased after two weeks and one month of treatment, with the treatment group showing significantly lower pain scores. Recurrence rates after six months and one year were significantly lower in the treatment group compared to the control group.

According to the results of this study, treatment with electroacupuncture combined with *Tuina* for CTS can improve wrist joint range of motion and median nerve conduction velocity. Additionally, it effectively relieves pain, improves wrist motor function, and reduces clinical recurrence rates.

These promising results further highlight the importance of applying acupuncture within an integrated context of traditional Chinese medicine techniques—specifically, in conjunction with *Tuina* massage.

In this context, it would also be beneficial to explore the application of other traditional Chinese medicine techniques, either in combination with acupuncture or as standalone treatments. Examples include cupping therapy [59-62] or even traditional phytopharmacology [63-66].

## 3. Conclusions

In TCM, CTS is a Painful Obstruction (*bi*) Syndrome linked to Wind, Cold, and Dampness, leading to *Qi*, Blood, and fluid stagnation. Neurovascular and tendon atrophies are explained by classical channel pathologies.

Clinical evidence generally shows significant pain reduction, improved nerve function, and enhanced circulation with acupuncture—particularly at PC 7 and PC 6—both locally and distally. Combining acupuncture with *Tuina* or conventional therapies offers additional benefits, though more high-quality studies are warranted.

Overall, integrative approaches grounded in TCM theory hold significant potential to improve quality of life for CTS sufferers and may reduce dependence on invasive or pharmacological interventions..

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*Review*

# Qigong for Managing Parkinson's Disease Symptoms: A Preliminary Review of Meta-Analyses.

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**Abstract:** Qigong, an ancient mind-body practice centred on movement and energy cultivation, offers a potential avenue for improving the quality of life, particularly for individuals with chronic conditions. This review focuses on meta-analyses regarding Parkinson's disease (PD), the second most prevalent neurodegenerative disorder, characterized by both motor (tremors, gait and speech impairments) and non-motor (depression, anxiety, sleep disturbances) symptoms. The objective is to assess the potential of Qigong to enhance various aspects of well-being in PD patients, including emotional state, balance, mobility, coordination, and tremor reduction. Furthermore, this review seeks to understand Qigong's impact on physical and emotional health, social engagement, and independence, and to evaluate its effectiveness as an adjunct or alternative treatment in early-stage PD. Findings suggest that Qigong holds promise in reducing anxiety and depression, fostering relaxation, and promoting overall physical and mental well-being by improving motor and non-motor symptoms of PD patients.
Despite promising results, methodological limitations include heterogeneous protocols, restricted populations, and scarcity of longitudinal studies, pointing to the need for more rigorous randomized clinical trials, with standardized protocols and diverse populations, to establish Qigong as a validated complementary therapy for PD.

**Keywords:** Parkinson's Disease; Qigong; Traditional Chinese Medicine; Quality of Life.

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## 1. Introduction

PD, also known as idiopathic degenerative disease, is a progressive neurological condition characterized by the degeneration of dopaminergic neurons, leading to a spectrum of motor, mental health, sleep, pain, and other health-related issues [1,2]. While there is no cure, therapies and medications can significantly alleviate symptoms. Common symptoms include tremors, painful muscle contractions (dystonia), speech difficulties, and olfactory and gustatory dysfunctions. PD results in high rates of disability and a substantial need for care [2-4].

The disease typically manifests in individuals over fifty, although younger individuals can also be affected. Men are statistically more likely to develop PD than women. A familial history of PD is also a significant risk factor. Exposure to air pollution, pesticides, and solvents may further increase the risk. Symptoms of PD worsen over time, leading to a progressive decline in physical and mental well-being, and consequently, a reduced quality of life [1,5,6].

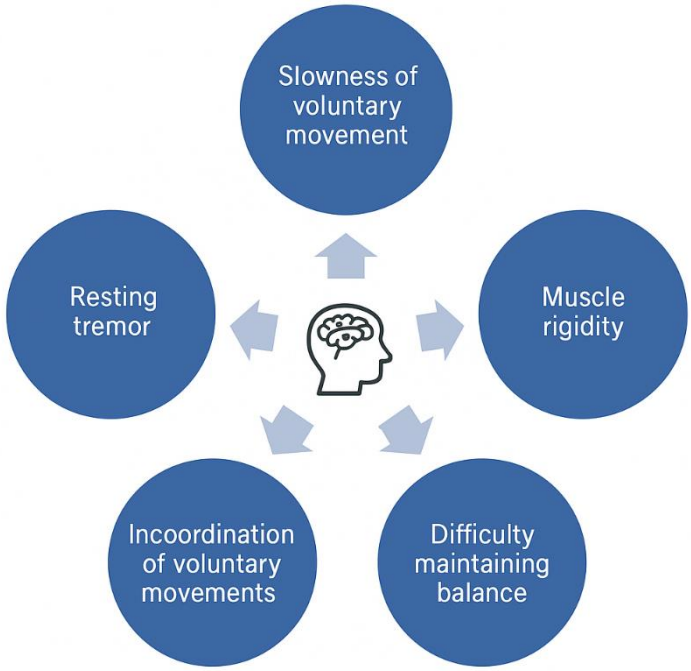


Figure 1: Parkinson's Disease: Key Signs and Symptoms

As well, non-motor symptoms such as cognitive impairment, mental health disorders (depression, anxiety), dementia, sleep disturbances, pain, and sensory disturbances. Dyskinesia and dystonia can further complicate speech and mobility [7-9].

PD is the second most prevalent progressive neurodegenerative disease worldwide in middle-aged individuals [1,10]. From 1990 to 2015, over six million people were affected, and projections suggest that this number could exceed twelve million by 2040 [11].

Both motor and non-motor symptoms of PD significantly impact patients' lifestyles. The primary challenge is to minimize symptoms and slow disease progression. Pharmacological treatment is tailored based on cognitive status and functional deficits.

Levodopa or dopamine agonists are first-line treatments, but their efficacy diminishes as the disease progresses, leading to complications such as psychosis, compulsive behaviours, agitation, hallucinations, and depression, the most common comorbidity. Studies confirm that while these drugs alleviate some symptoms and delay progression, they do not prevent depression and anxiety [12]. Carbidopa is often combined with levodopa to reduce side effects. Anticholinergic medications, though less effective than levodopa, are associated with dry mouth, blurred vision, constipation, urinary retention, and in severe cases, memory impairment, depression, and anxiety. Monoamine oxidase B (MAO) inhibitors, such as selegiline, are also used but can cause delirium and hallucinations. Catechol-O-methyltransferase (COMT) inhibitors like tolcapone and entacapone are alternatives, but tolcapone carries a risk of severe liver dysfunction. Dopamine agonists, including bromocriptine, pergolide, and ropinirole, may be first-line treatments in younger patients (fewer motor fluctuations, longer life expectancy), with side effects including nausea, sedation, dizziness, and vivid dreams [13-15].

Overall, conventional pharmacological treatments for PD pose challenges due to their combination use, leading to significant and prevalent side effects. Therefore, individualized treatment and close patient monitoring are essential [16]. Novel molecules are currently under clinical trial to address unmet needs, particularly in Parkinsonism associated with the GBA gene [17,18].

Traditional Chinese Medicine (TCM) offers a holistic approach to managing various conditions, including PD. Practices like Tai Chi, Qigong, and Baduanjin aim to balance body and mind, regulate Qi (vital energy), and promote overall well-being [19]. TCM focuses on restoring harmony within the body, mind, and spirit, treating the individual as a whole rather than isolated symptoms [20,21].

Specifically, Qigong is recognized as a tool for chronic disease prevention and management, stress reduction, and physical and mental well-being promotion [19,22]. It is accessible for patients with functional limitations, involving gentle, repetitive movements and controlled breathing to circulate energy and blood, balance organ function, mobilize muscles, strengthen joints and tendons, and enhance immune defences [23-25]. This practice naturally activates physiological and psychological self-repair and recovery mechanisms, focusing on posture, breathing, and mental concentration to promote longevity and quality of life [19,26].

This review of meta-analyses aims to evaluate the potential of Qigong in managing PD signs and symptoms, and its benefits in improving quality of life, emotional well-being, balance, mobility, coordination, and tremor reduction. It seeks to understand Qigong's impact on patients' quality of life, considering both physical and emotional aspects, as well as its ability to enhance social interaction and patient autonomy. Furthermore, it aims to evaluate Qigong's efficacy in combination with or as an alternative to conventional medical treatment in less severe cases.

## 2. Methods

### *2.1. Search strategy*

To identify relevant systematic reviews and meta-analyses, researchers conducted a comprehensive search of four major databases (PubMed, Scopus, Science Direct, and Scielo) from their inception up to January 23, 2025. The search focused on Qigong as an intervention for PD, using a detailed formula: (Qigong OR Chikug OR "Qi Gong" OR "traditional Chinese exercises") AND (Parkinson OR Parkinson's OR Parkinsonism OR "paralysis agitans" OR "shaking palsy") AND ("Meta-analysis").

Titles and abstracts were screened by the researchers, with conflicts resolved through discussion. After the full-text search, the same method was used for the full-text assessment.

### *2.2. Eligibility criteria*

This review included systematic reviews with meta-analyses of Qigong interventions in humans, published in English, Portuguese, Spanish, or French. Studies assessing PD motor and non-motor outcomes were included, while animal studies and non-Qigong interventions were excluded.

### *2.3. Data extraction*

Data extraction was conducted by two researchers, with disagreements resolved through discussion with a third. For each included article, key information such as authorship, year, title, journal, number of included studies and their methodologies, and major findings were recorded.

## 3. Results

The flowchart (Figure 1) reports the selection of studies.

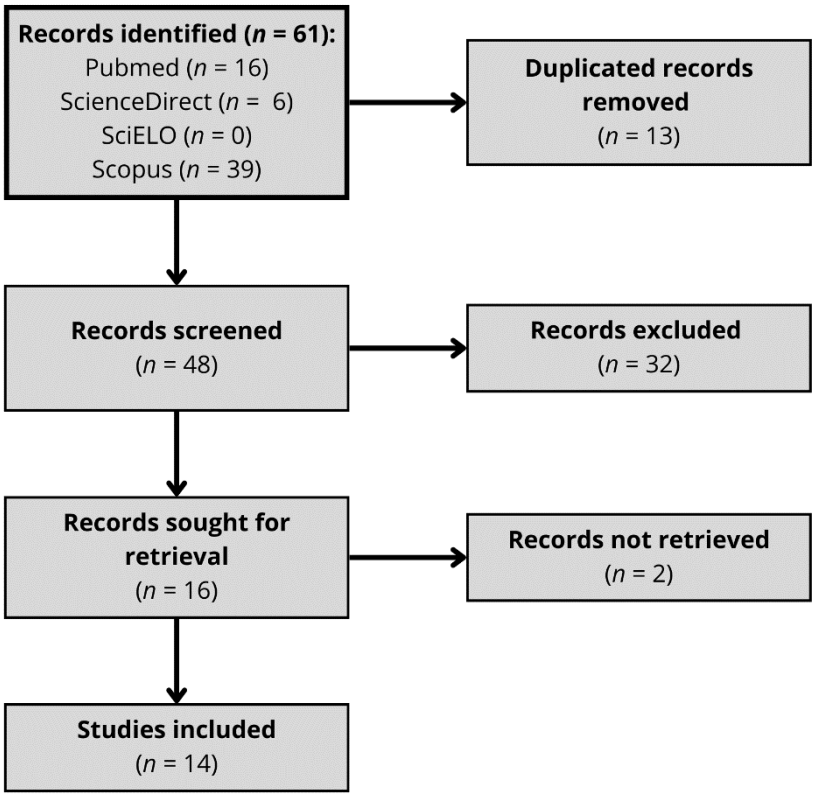


**Figure 1.** PRISMA Flowchart of Study Selection.

A total of 61 studies were identified. After duplicates were removed, 48 remained. After title/abstract screening, 16 studies were searched for retrieval. Two studies could not be found. Therefore 14 studies were included in the final analysis.

Table 1 summarizes the included studies.

Table 1. Major findings of the included studies.

| Study | Studies assessed | Major findings |
|---|---|---|
| Song *et al.* [27] | 15 | Significant improvements were observed on most motor outcomes (UPDS III [ES=-0.444, p<.001], balance [ES=0.544, p<.001], TUG [ES=-0.341, p=.005], 6MWT [ES=-0.293, p=.06]), falls [ES=-.403, p=.004], and non-motor outcomes such as depression [ES=-0.457, p=.008] and QoL[ES=-0.393, p<.001]. Cognition did not show significant improvements [ES= -0.225, p=.477]). |
| Tan *et al.* [28] | 18 | Significant improvements in depression-related scales (standardized mean difference (SMD) = –1.30, 95% confidence interval (CI): –2.10 to –0.49, $p$ = 0.002 ); Anxiety-related scales (SMD = –1.11, 95%CI: –2.14 to –0.08, $p$ = 0.03), sleep disorder-related scales (SMD = –0.71, 95%CI: –0.99 to –0.43, $p$ < 0.00001);<br>Cognition-related scales (SMD = 0.91, 95%CI: 0.44 to 1.38, $p$ = 0.0001); QoL also improved (SMD = –1.35, 95% CI: –2.38 to –0.31, $p$ = 0.01; SMD = 0.99, 95% CI: 0.54 to 1.43, $p$ < 0.0001). |
| Chen *et al.* [29] | 7 | Significantly positive effects on motor symptoms (SMD=0.59, 95% CI [0.24, 0.93]), walking ability (SMD=0.78, 95% CI [0.10, 1.47]), and balance (SMD=0.72, 95% CI [0.23, 1.20]) in patients with PD.<br>Subgroup analysis showed Qigong exercise had a significant difference in improving motor symptoms and walking ability compared to passive control (P<0.01), and no significant difference compared to active control. Subgroup analysis of Qigong exercise revealed a significant difference in balance compared to both active and passive control (P<0.05). |

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| McMahon *et al.* [30] | 12 | Nonpharmacological interventions demonstrated significant effects for Inspiratory Muscle Strenght (MD 19.68; CI 8.49, 30.87; z=3.45; p=0.0006; I2 =2%); Expiratory muscle strength (MD 18.97; CI 7.79, 30.14; z=3.33; p=0.0009; I2 =23%); Peak expiratory flow (MD 72.21; CI 31.19, 113.24; z=3.45; p=0.0006; I2 =0%); FVC (MD 0.30; CI –0.03, 0.63; z=1.76; p=0.08; I2= 0%); FEV1 (MD 0.27; CI -0.02, 0.57; z=1.80; p=0.07; I2=0%). |
| Mustafaoglu *et al.* [31] | 60 (6 qigong) | Qigong (MD: 0.32; 95% CI (0.00, 0.64) was most effective in improving gait speed. |
| Yang *et al.* [32] | 15 (Tai Chi and Qigong) (13 RCTs and 2 non-RCTs) | Tai Chi plus medication showed greater improvements in motor function ( SMD, -0.57; 95%, CI -1.11 to -0.04), (BBS, SMD, -1.22; 95% CI -1.65 to -0.80), and time up and go test (SMD, -1.06; 95% CI -1.44 to -0.68). Compared with other therapy plus medication, Tai Chi plus medication also showed greater gains in motor function (SMD, -0.78; 95% CI -1.46 to -0.10), BBS (SMD, -0.99; 95% CI -1.44 to -0.54), and functional reach test (SMD, -0.77; 95% CI -1.51 to -0.03). However, Tai Chi plus medication did not show better improvements in gait or quality of life. There was not sufficient evidence to support or refute the effect of Qigong plus medication for PD. |
| Wang *et al.* [33] | 40 | Analysis of active and non-active comparisons showed significant effects for tai chi/Qigong (P<0.05) on global cognitive function, executive function, memory, visuospatial ability, and cognitive processing speed. Tai chi and Qigong can be beneficial for improving global cognitive function (SMD = 0.64, 95% CI: 0.39-0.90, I2 = 85%, P < 0.00001. |
| Jin *et al.* [25] | 22 | Mind-body exercises significantly improved motor function in PD patients, including UPDRS (SMD=−0.61, p < 0.001), TUG (SMD=−1.47, p < 0.001) and balance function (SMD= 0.79, p < 0.001). Mind-body exercises also had significant effects on depression (SMD=−1.61, p= 0.002) and QoL (SMD= 0.66, p < 0.001). |
| Lai *et al.* [34] | 10 | Baduanjin significantly improved the motor function of patients with PD, based on the UPDRS Part III (MD −5.37, 95% CI −8.96 to −1.78, p=0.003) and Fugl- Meyer Assessment of Lower Extremity (MD 5.39, 95% CI 2.71 to 8.07, p<0.0001); It also significantly improved the balance of patients with PD, based on the BBS (MD 4.40, 95% CI 3.08 to 5.73, p<0.00001); As well, Baduanjin significantly improved the gait of patients with PD, based on the 6 min walk distance (MD 21.62, 95% CI 11.14 to 32.10, p<0.0001) |
| Tang *et al.* [35] | 19 (7 taichi) (2 qigong) | Tai chi demonstrated significant improvements versus control for TUG and BBS. |
| He *et al.* [36] | 58 | Qigong was associated with improved outcomes in the TUG test (MD −5.54, 95%, CI −8.28 to −2.77) |
| Hao *et al.* [37] | 60 studies Baduanjin Qigong training = 3 Taiji Qigong training = 8 | Compared to a control, Taichi was able to show significant improvements in the UPDRS score [MD =−4.26, 95% CI = (−6.63,−1.88)] and the TUG test [MD =−1.56, 95% CI = (−2.59,−0.54)]. Baduanjin Qigong showed significant improvements against control in the BBS [MD = 5.51, 95% CI = (0.46, 10.55). |

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| **Wang *et al.*** [38] | 62 Traditional Chinese Exercise (n = 5) including Qigong and Tai chi | Compared to occupational group activities, Tai chi and Qigong showed significant improvement effects on depression (SMD: −2.14; 95% CI:−4.10–−0.18).<br>Compared to stretching exercises Tai chi and Qigong showed significant improvement effects on depression (SMD:−1.58; 95% CI:−2.52–−0.63). |
| **Wu *et al.*** [39] | 15 | The meta-analytic findings revealed significant improvements in balance outcomes [(BBS) (g = 0.83, 95% CI = 0.37–1.29, p= 0.000, I2 = 84%), TUG (g = −0.80, 95% CI= −1.13–−0.47, p= 0.000, I2= 81%), and the one-legged blind balance test (g = 0.49, 95% CI = 0.13–0.86, p = 0.01, I2 = 10%)], as well as gait outcomes [gait velocity (g = 0.28, 95% CI = 0.02–0.54, p= 0.04, I2 = 64%), 6MWT (g= 0.32, 95% CI 0.01–0.62, p= 0.04, I2 = 15%), stride length (g= 0.25, 95% CI= 0.08–0.41, p= 0.003, I2 = 42%)], and motor symptoms [UPDRS part III (g= −0.77, 95% CI= −1.06–−0.48, p= 0.000, I2 = 76%)]. However, cadence (g = −0.03) and step length (g = 0.02) did not differ significantly.<br>The moderator shows that the effects of TCE on BBS and gait velocity were moderated by Pedro score, exercise type, control group type, and number of sessions. Meta-regression found that TCE (exercise duration, number of sessions, and session duration) was significantly associated with improved UPDRS-III and BBS scores. |

UPDRS - Unified Parkinson's disease rating scale, TUG - Timed Up and Go Test, BBS - Berg Balance Scale, SMS - Standardized Mean Difference, CI - Confidence interval, TCE – Traditional Chinese Exercise, 6MWT - 6-min walking test, MD - Mean Deviation, QoL – Quality of Life, FEV1 - Forced Expiratory Volume, FVC - Forced vital capacity, ES - Effect size.

## 4. Discussion

The analyzed studies confirm Qigong's effectiveness in reducing motor symptoms associated with PD, demonstrating significant improvements in balance, mobility, and muscle rigidity. The study by Song *et al.* [27] indicated a potential benefit of Qigong in enhancing motor performance, function, and quality of life. Furthermore, the studies by Chen *et al.* [29] and Lai *et al.* [34] suggest that Qigong and Baduanjin (an eight-exercise Qigong sequence) can contribute to increased motor function, walking ability, and balance in patients, with regular practice potentially reducing tremors and bradykinesia. Another interesting finding is the likelihood that Qigong exercises can enhance the effectiveness of medications like levodopa, potentially reducing adverse effects associated with long-term use, such as dyskinesias, as in the study by Yang *et al.* [32], in which Qigong was used as a complementary therapy alongside pharmacological treatments for PD.

Additionally, several studies highlight Qigong; some reviews indicate that techniques like dance or yoga may be equally effective in certain aspects, such as improving quality of life and balance. However, Qigong demonstrated superiority in improving motor functionality compared to passive therapies or inactive control groups. Consistent with prior findings Chen *et al.* [29], demonstrated that Qigong had significant positive effects on motor symptoms, walking ability, and balance. For balance, Qigong also showed a significant improvement compared to both active and passive therapies. Furthermore, in the study by Yang *et al.* [32], Tai Chi and Qigong were used as complementary treatments to pharmacological treatment for mild to moderate PD. The combination of Qigong showed significant improvements when compared to pharmacological treatment applied in isolation.

For non-motor symptoms, Tan *et al.* [28] and Jin *et al.* [25] studies indicated that traditional Chinese medicine exercises might alleviate the severity of neuropsychiatric symptoms, including depression, anxiety, and sleep disorders, and improve cognitive function and overall quality of life in PD patients. These studies also suggest Qigong positively impacts mood and coping abilities, and its regular practice enhances sleep quality by reducing

insomnia and promoting deeper rest, consistent with earlier findings by Jin *et al.* [25]. Consistent with prior findings Wang *et al.* [38], demonstrated that Qigong was an effective intervention for improving cognition in patients with PD, stroke, mild cognitive impairment, dementia, and traumatic brain injury; however, no RCTs were conducted for other neurological disorders. He *et al.* [36] conclude that mindfulness-based therapy, specifically Qigong, is a preferred non-pharmacological alternative based on motor/sensory intervention for patient rehabilitation.

Worthy of note, consistent with prior findings, He *et al.* [36], demonstrated that Qigong was performed two to five times weekly, leading to the belief that a higher treatment frequency would positively impact its effectiveness. According to Wu *et al.* [39], the frequency, number, and duration of traditional Chinese medicine exercises, such as Qigong, can affect the extent of their favourable therapeutic effects.

The observed benefits of Qigong can be attributed to various physiological and psychological mechanisms. This practice regulates the autonomic nervous system, balancing sympathetic and parasympathetic activities, which aids in stress relief and maintaining bodily equilibrium [19]. The repetitive exercises and mental focus characteristic of Qigong stimulate neuroplasticity [40,41] promoting the formation of new neural connections. The activation of the body-mind axis, through a combination of gentle exercises, respiratory control, and concentration, significantly improves functional integration, culminating in rhythmic and controlled movements that enhance blood circulation and muscle oxygenation, contributing to recovery and overall well-being. In a simplified sense, Qigong practice can activate the parasympathetic response, promoting a reduction in heart rate, blood pressure, and cortisol levels, thus favouring a state of deep relaxation and reducing the impact of chronic stress [22,26]. Consequently, it may be particularly effective in diminishing symptoms related to anxiety and depression [40,41]. It is also suggested that Qigong can improve cardiovascular function by optimizing blood flow and tissue oxygenation, supporting recovery and alleviating physical tensions [42-44]. The practice also actively engages the vagus nerve, which plays a crucial role in modulating the central nervous system, assisting in stress reduction and fostering a state of deep relaxation [45]. Controlled breathing, a core element of Qigong, facilitates a state of calm and internal balance [46,47]. This respiratory practice contributes to improved physiological control over stress, enhancing the body's capacity to recover from stressful situations.

## 5. Limitations and Final Considerations

One of the main limitations in studies on the health benefits of Qigong, especially in patients with neurodegenerative diseases like PD, relates to the methodological variability among investigations. The heterogeneity in Qigong practice protocols, including differences in frequency, duration, and specific types of exercises performed, makes it difficult to compare results and can compromise the accuracy of the evidence obtained. Several studies adopt different approaches regarding the number of weekly sessions, the intensity of activities, and the duration of intervention programs, which makes it difficult to draw definitive conclusions about the consistent and comprehensive effects of Qigong practice. This lack of standardization in protocols is a challenge for the development of universal therapeutic recommendations.

It is noted that there is a scarcity of studies that include diverse populations, both in terms of geographical location and in the stages of PD progression. The majority of investigations focus on restricted groups, such as patients from a specific country or region, or in specific stages of the disease. This limitation reduces the generalizability of the results for different population groups and clinical conditions, as the response to Qigong may vary according to cultural and environmental factors and the stage of the disease. The inclusion of a broader and more diverse sample would allow for a more comprehensive understanding of the effects of the practice on different subgroups of patients.

Another important limitation concerns the scarcity of studies that assess the long-term effects of Qigong practice. Most available studies focus on short-term interventions, usually lasting a few weeks or months, leaving open the question of how the observed

benefits are sustained over time. As mentioned by Liu *et al.* [41], the lack of data on the maintenance of the benefits of long-term Qigong practice represents a significant gap, and future studies should focus on this issue to validate the continued effectiveness of Qigong, especially for chronic diseases such as PD, which require long-lasting interventions.

Finally, it is essential to conduct rigorous, controlled, and randomized clinical trials that explore not only the motor benefits of Qigong but also more data on the effects on non-motor symptoms, such as depression and anxiety. The inclusion of adequate control groups and the standardization of Qigong protocols in future studies will contribute to a more solid and comprehensive understanding of the therapeutic potential of this practice in patients with PD. Only through methodologically rigorous studies will it be possible to establish Qigong as a widely recognized and validated therapeutic method for the complementary treatment of neurodegenerative diseases.

## 6. Conclusions

The analyzed studies suggest Qigong is a promising complementary therapy for PD, significantly improving motor symptoms like balance, mobility, and rigidity, potentially enhancing motor function and quality of life, and showing superiority over passive therapies. It may also complement medication. Furthermore, Qigong appears to alleviate non-motor symptoms such as depression, anxiety, and sleep disorders and may improve cognition. Proposed mechanisms involve nervous system regulation and neuroplasticity. However, methodological variability and limited long-term data necessitate further rigorous research with standardized protocols and diverse populations to solidify these findings and establish Qigong as a validated complementary treatment for PD.

With the growing interest in integrative therapies, Qigong may become a valuable addition to multidisciplinary PD care pending further validation.

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*Review*

# Chaga (*Inonotus obliquus*) in Healthspan: An Integrative Perspective of Naturopathy and Traditional Chinese Medicine.

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**Abstract:** Chaga mushroom (*Inonotus obliquus*) has been recognized for its medicinal properties and health benefits for centuries, particularly in Eastern Europe and Russia. Chaga is known for its antioxidant, anti-inflammatory, and immunomodulatory properties, and is commonly consumed as a food mushroom due to its high content of antioxidants, proteins, minerals, fiber, and vitamins. Studies suggest its potential in neuroprotection, cancer therapy, and immune-related conditions. While Chaga is generally considered safe, there are potential risks associated with prolonged use and high concentrations of certain compounds. Integration of Chaga in Naturopathy and Traditional Chinese Medicine (TCM) emphasizes its role in promoting healthy aging and longevity by tonifying the Kidneys, strengthening *Qi*, and calming the *Shen*.
This review explores the multifaceted biological activities of Chaga, emphasizing its potential as a preventive and therapeutic agent in various health conditions. By bridging traditional knowledge with emerging scientific evidence, it underscores the role of Chaga in healthspan.

**Keywords:** Chaga; Inonotus obliquus; Naturopathy; Traditional Chinese Medicine; Aging.

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## 1. Introduction

Aging consists in a multifactorial process of molecular and cellular decline that we all experience with time [1]. This aging process depends on many factors, such as genetic, dietary and pharmacological intervention and environmental conditions. These factors compromise fate and rate of aging [2].

In fact, how the living being responds to daily stress, challenges and insults is strictly related to the aging process [3,4].Having that said, healthy aging refers to the retard process of the cellular and molecular decline for the maximum period which leads to longevity [3-7].

To achieve longevity and healthy aging is important to understand lifestyle and environmental factors and understand which patterns link to disease prevention and maximizes health [8]. A form of primary care medicine that integrates traditional healing practices with modern scientific advancements and contemporary research is Naturopathy and TCM [9,10].

Naturopathy practice is guided by a unique set of principles that acknowledge the body's inherent ability to heal itself, emphasize the prevention of disease, and promote individual responsibility in achieving optimal health [10]. Whereas TCM represents a structured healthcare system derived from extensive clinical observation and experimentation, underpinned by a scientific framework of regulation. TCM encompasses distinctive theories and methodologies aimed at disease management and health optimization [11,12].

Mushrooms are utilized as therapeutic agents in both Naturopathy and TCM. These fungus have been widely consumed in the human diet as a supplementary food since

ancient times. They are a rich source of secondary metabolites, vitamins, minerals, protein, and carbohydrates, as well as being high in fiber and low in fat. Additionally, they contain various bioactive compounds such as terpenoids, steroids, phenols, nucleotides, glycoprotein derivatives, and polysaccharides, which make them potential sources of antioxidant and anti-inflammatory activity [13]. These compounds are responsible for the medicinal properties of the mushroom, making it valuable for therapeutic applications [14]. Medicinal mushrooms and their bioactive preparations are considered nutraceuticals, used for health promotion and disease prevention. Producing them requires knowledge of mushroom species, as well as control over cultivation and processing to ensure safety and effectiveness [14]. However, its high cost and cultivation difficulties limit its availability in diets [13].

*Inonotus obliquus* is a Basidiomycetes species found in birch forests of Russia, Korea, Europe, the USA, and Canada. It is known by various names, including "Gift from God" in Siberia and "King of Plants" in China [13]. This fungus is a sterile fungus that destroys trees and parasitizes the trunks of live birch trees. It belongs to the Hymenochaetaceae family and thrives in humid regions [15,16]. The *Obliquus* species is known for its medicinal and pharmacological properties [17].

Chaga sclerotium grows on the trunks of old birch trees, from which it absorbs medicinal compounds, including betulin and betulinic acid, which are derived from the birch trees themselves. These bioactive compounds contribute to Chaga's therapeutic effects [1]. Like others medicinal mushrooms, Chaga has been recognized for its healing properties in both traditional and modern medical practices [18].

Most *I. obliquus* populations form fruiting bodies, which take 10–15 years to mature for medicinal use. To overcome this, artificial methods like liquid fermentation are used to grow *I. obliquus* mycelia, offering shorter production cycles and higher yields. Submerged fermentation is particularly effective for producing biomass and bioactive compounds, including exo-polysaccharides. Recent studies have optimized this process for enhanced production of bioactive polysaccharides [19]. Globally, Chaga is recognized for its therapeutic benefits and the discovery of new bioactive metabolites for use in pharmaceutical, chemical, and cosmetic products [20].

## 2. A Naturopathic perspective on Chaga

### *2.1. Traditional use*

Chaga sclerotium has a long history of medicinal use in Eastern Europe, with records indicating its use dating back to at least the 12th century. Historical accounts suggest that the Russian duke Vladimir Monomach reportedly cured himself of lip cancer using Chaga. The Khanty people, an indigenous group from Siberia, traditionally utilized this mushroom in beverages and meals to enhance vitality and prevent degenerative diseases [1].

The preparation methods of Chaga in indigenous herbal and non-medicinal uses vary between tribes and cultures. In some tribal practices, Chaga is used to enhance immune function and treat conditions such as diabetes and tumors [18]. This mushroom is commonly consumed as a food mushroom, as it is rich in antioxidants, proteins, minerals, fiber, and vitamins [18].

### *2.2. Pharmacological properties*

Only the young and fresh sclerotia of *Inonotus obliquus*, specifically those found on birch trees and collected year-round, are considered suitable for medicinal use [21]. It is essential that the sclerotia are harvested from pristine, unpolluted environments, as the fungus has the potential to absorb environmental contaminants [22]. This species naturally thrives in regions with harsh climatic conditions, including extreme seasonal temperature variations, freezing winters, exposure to ultraviolet radiation, and frequent bacterial or viral challenges [23,24]. To adapt to such environmental stressors, *I. obliquus* has developed

sophisticated defense strategies, producing a range of bioactive compounds such as antioxidants, triterpenoids, ergosterol derivatives, sesquiterpenes, benzoic acid derivatives, hispidin analogs, and melanins [21].

*Inonotus obliquus* exhibits pharmacological properties, including potent antioxidant [25], immunomodulatory [26] and anti-inflammatory activities [27,28]. These properties make it a valuable natural compound in the fight against aging and the enhancement of healthspan.

Antioxidant properties

Antioxidants play a critical role in mitigating oxidative damage to biomolecules by reducing reactive oxygen species (ROS) levels, thereby protecting body cells from harm caused by free radicals. Free radicals interact destructively with biomolecules, contributing to the onset of diseases such as cancer [29], aging [30] and atherosclerosis [31,32]. By inhibiting free radical attacks, antioxidants can prevent lipid oxidation within cell membranes, enhancing the cellular defense mechanisms against damage [32].

The polysaccharides extracted from Chaga exhibit significant antioxidant activity through their ability to scavenge superoxide radicals [33,34]. This mechanism is thought to occur via the donation of hydrogen atoms by the polysaccharides, which combine with free radicals to form a stable radical. This process effectively terminates the harmful chain reactions caused by oxidative stress, thereby protecting cells from damage. Such antioxidant properties are crucial in reducing oxidative damage, which is linked to aging and various chronic diseases [33,34]. For instance, a comparative study demonstrated that ethanol extracts inhibit superoxide dismutase (SOD) activity, and a higher DPPH (2,2-diphenyl-1-picrylhydrazyl) scavenging ability compared to hot water extracts. Hot water extractions, particularly at elevated temperatures, also display enhanced antioxidant capabilities [35].

The antioxidant activity of Chaga extends to neuroprotection [36]. A study from 2011 demonstrated that Chaga extract improved cognitive function in scopolamine-induced amnesia in mice, increasing endogenous antioxidants such as glutathione and superoxide dismutase levels, and enhancing memory and learning abilities [36].

The neuroprotective effects of flavan derivatives, polysaccharides, and 3,4-dihydroxybenzalacetone isolated from *Inonotus obliquus* have been demonstrated in models of neurodegenerative diseases such as Alzheimer's and Parkinson's, as well as in the SH-SY5Y cell line [10,13,37]. These substances have been found to mitigate oxidative stress and promote the upregulation of superoxide dismutase (SOD) expression [25].

A study demonstrated that birch sap (*Betula alba*) and extracts from *Inonotus obliquus* exhibit potent antioxidant properties by preventing the formation of reactive oxygen species (ROS) and mitigating oxidative stress induced by UV irradiation [38]. Furthermore, the tested compounds displayed immunomodulatory effects, as evidenced by a reduction in pro-inflammatory cytokine levels following UV exposure [38]. The extracts also contributed to the protection of keratinocytes by decreasing UV-induced DNA damage [38]. These findings highlight the photoprotective potential of *Betula alba* sap and *Inonotus obliquus* extracts in skin cells exposed to UV-A and UV-B radiation [38]. Given their antioxidant, anti-inflammatory, and DNA protection/repair activities, these bioactive compounds represent promising candidates for the development of cosmetic formulations aimed at counteracting photoaging [38].

The antioxidant properties of Chaga are particularly crucial in mitigating the effects of oxidative stress, a primary driver of aging and the onset of age-related diseases. As we age, the body's ability to neutralize free radicals diminishes, leading to cellular damage and the accumulation of oxidative stress [39]. By neutralizing ROS, Chaga reduces oxidative damage to cells, protecting cellular integrity and contributing to longevity and healthspan [39].

Immunomodulatory Properties

The immunomodulatory effects of Chaga can counteract the decline in immune function associated with aging. As the immune system weakens over time, individuals become more susceptible to infections, autoimmune disorders, and chronic inflammatory conditions [21]. Polysaccharides derived from mushrooms are potent biologically active compounds that significantly enhance both innate and adaptive immune responses, positioning them as promising immunostimulators . Their potential extends to various clinical and medicinal applications, offering opportunities for therapeutic interventions in immune-related conditions [40-42].

Polysaccharides isolated from sclerotia, and submerged culture mycelia have also been utilized as immune-enhancing agents, functioning as biological response modifiers (BRMs) that stimulate both cellular and humoral immunity [43]. These immunomodulatory effects likely contribute to their antitumor activity. Clinically, polysaccharides, like β-glucans, have been widely employed in cancer therapies for their immunomodulatory benefits [43].

Additionally, triterpenoid compounds extracted from Chaga have demonstrated significant anticancer properties, including the inhibition of cancer cell proliferation, induction of cell cycle arrest at various checkpoints and enhancement of apoptosis [44,45]. These compounds also regulate key signal transduction pathways involved in cellular growth and survival, making them potential candidates for cancer therapy. Notably, the triterpene inotodiol has been shown to exhibit antihistamine-like effects by inhibiting mast cell degranulation in the small intestine, providing a potential therapeutic avenue for managing food allergies in animal models [44,45].

Anti-inflammatory Properties

Studies have shown that Chaga extracts effectively reduce inflammation markers, suggesting their potential in managing chronic inflammatory conditions that hinder healthspan. Macrophages, which play a key role in inflammation, can release mediators such as nitric oxide (NO), prostaglandins (PGE2) and pro-inflammatory cytokines (e.g., TNF-$\alpha$, IL-1β, and IL-6) [46]. Studies on methanol extracts of Chaga demonstrated their capacity to inhibit macrophage activity, reducing the production of NO, PGE2 and cytokines [46].

In a study from 2012, aqueous Chaga extracts significantly alleviated dextran sodium sulfate (DSS)-induced colitis [47]. The extracts reduced edema, mucosal damage and crypt loss while suppressing the expression of inflammatory cytokines and lowering levels of inducible nitric oxide synthase (iNOS) [47]. Furthermore, they decreased the accumulation of myeloperoxidase in the colon, indicating reduced inflammatory activity [47].

Aqueous Chaga extracts suppress the expression of inflammatory mediators such as p53, caspase-3 and microcystin-LR, which contribute to inflammation and hepatotoxicity in mice. Another highlighted the ability of Chaga extracts to mitigate carbon tetrachloride (CCl4)-induced liver damage. Ergosterol peroxide isolated from Chaga was shown to bind and inhibit the activity of pro-inflammatory proteins, further confirming its anti-inflammatory efficacy [48].

Additionally, betulin and betulinic acid, compounds found in *Inonotus obliquus* [49], have demonstrated notable anti-inflammatory and antimicrobial properties. These compounds modulate immune cell activities and inhibit the production of pro-inflammatory mediators, suggesting their therapeutic potential for inflammatory disorders [50].

A chemical investigation of the fruiting bodies of *Inonotus obliquus* identified seven novel lanostane-type triterpenoids (inonotusols H–N), all of which inhibited NO production in lipopolysaccharide-stimulated BV-2 microglial cells. Inonotusols I and L showed the strongest suppression of inducible nitric oxide synthase (iNOS) and NO production without cytotoxicity . Molecular docking confirmed their interaction with iNOS, highlighting their anti-inflammatory potential [51].

Finally, the anti-inflammatory properties of Chaga are critical in managing the chronic inflammation that accelerates aging. Chronic low-grade inflammation, often referred to as "inflammaging," is linked to the development of cardiovascular diseases, arthritis, and neurodegenerative diseases [13,38]. By modulating the production of pro-inflammatory cytokines and reducing inflammation, Chaga helps mitigate these risks, thereby contributing to a healthier aging process. Inflammation is a key driver of many age-related diseases, and by addressing this underlying issue, Chaga offers a natural means of promoting healthy aging [13,38].

## 3. A Traditional Chinese Medicine (TCM) Perspective on Chaga

Aging is described in The Yellow Emperor's Classic of Chinese Medicine as a natural physiological process that is intrinsically linked to the balance of *Yin* and *Yang*, the smooth flow of *Qi* (vital energy), and the preservation of *Jing* (vital essence) [52]. While aging occurs progressively over time, it can be significantly accelerated by factors such as emotional imbalances, poor lifestyle choices, and the depletion of *Jing*, which is stored in the kidneys and consumed throughout life [52].

The depletion of *Jing* is associated with both physical and mental decline. To mitigate premature aging, it is crucial to focus on preserving Jing, strengthening *Qi*, and maintaining a balanced and harmonious lifestyle [52]. This includes adopting practices such as regular meditation, moderate physical activity (e.g., *Qi Gong* or Tai Chi), and adhering to a nutrient-dense diet tailored to the body's constitution and seasonal variations [52]. Within the framework of TCM, healthy aging emphasizes vitality, mental clarity, and physical health achieved through a holistic and integrative approach [52]. Aging is regarded as a natural part of life that should be embraced, with the goal of fostering inner harmony, preserving energy, and aligning one's life with the rhythms of nature to achieve a graceful and fulfilling aging process [52].

Chaga mushroom is well-known for its "white rot" characteristics and has traditionally been consumed as a functional tea for its benefits in combating aging and promoting longevity [53]. *Inonotus obliquus* has a flavor described as slightly bitter and possessing a somewhat cold nature. This combination of taste and characteristics reflects its functional properties in traditional Chinese medicine, which considers the relationship between flavor and therapeutic effect. Bitterness is often associated with effects that may help to "drain" or "dry out" conditions in the body, while the cold nature is linked to properties that may assist in reducing heat and detoxifying the body [54].

Within TCM, *Inonotus obliquus* is recognized for its medicinal properties, particularly its role in strengthening the immune system and enhancing the body's resilience to disease. From an energetic perspective, Chaga is considered an adaptogenic mushroom that supports immune function, strengthens *Qi*, tonifies the Kidneys (which are considered the reservoir of vital essence or Jing), protects the Liver, strengthens the Stomach, calms the Heart, and soothes the *Shen* (spirit). Additionally, Chaga is noted for its detoxifying properties, which make it particularly beneficial in cases of Kidney energy exhaustion, rendering it appropriate for long-term use [55]. This mushroom further promotes blood circulation, reduces blood stasis (exhibiting analgesic effects) therefore tonifying the Heart, protecting the Liver, and revitalizing *Qi* [55].

## 4. Practical Application and Safety Considerations

Since antiquity, the use of *Inonotus obliquus* and its crude extracts has been regarded as generally harmless [18]. Despite the significant attention garnered by its bioactive properties over the last decade, the safety and toxicology of Chaga remain underexplored. The limited studies available present divergent perspectives on the mushroom's safety [18].

Several studies affirm the safety of Chaga for consumption by both animals and human [56]. For instance, research has demonstrated that alcohol-based and aqueous extracts of Chaga do not adversely affect primary porcine hepatocytes (PLP2) at a concentration

of 400 ppm compared to cells exposed to alcohol alone [57]. Additionally, other investigations report no significant effects on body weight, liver, or kidney functions in Kunming mice and Sprague-Dawley rats exposed to Chaga extracts [56,58].

Also, is already known that concentration of 20–160 μg/mL of IOPS do not produce toxicity and are safe to administrate this dose [59]. There is another study about the toxicity of *Inonotus obliquus* polysaccharides-chromium (III) where it was administrating daily doses of 1500 mg/kg and after four weeks later, the results showed 10% of formalin on liver, pancreas and kidney [60].

In opposition, some studies suggest potential risks. A study reported that ethanol extracts of Chaga were cytotoxic to HaCaT keratinocyte cells at concentrations ranging from 100 to 400 μg/mL. Furthermore, varying levels of oxalic acid, a toxic compound found in Chaga. have been documented [57,61,62]. Despite, when the ethyl acetate fraction does not contain pure IOPS (I*nonotus obliquus* polysaccharide) and only parts of it, it's safe to say that *Inonotus obliquus* ethyl acetate fraction is nontoxic [63].

Therefore, the consumption of medicinal mushrooms should be cautious, as their safety during pregnancy, lactation, and in children is still poorly understood [64]. Bioactive compounds found in mushrooms may affect the absorption of nutrients, vitamins, and trace elements [64]. Therefore, it is recommended that the elderly and children avoid excessive consumption [64]. Additionally, individuals taking medications or herbs should be careful when consuming mushrooms due to the risk of interactions with their bioactive compounds [64].

In fact, nowadays, Chaga mushroom has a wide range of pharmacological uses and so there are many ways to presenting it as a health product such as, healthy food products, teas, tablets, tinctures, capsules and beverage, according to some ecommerce platforms [21,59]. Thedifferent applications of Chaga are because there are varied functions as well [65]. Depending on the brand and the application form, it's possible to obtain diverse benefits from preventing and treating diabetes or enhance immunity to anti allergic function [65]. Despite that, infusions and inhalation are the most common and traditional ways of use internally and antiseptic soaps externally [66].

The overuse of natural fungi, including Chaga, is a growing concern among medical experts [67]. Nutritional and environmental factors influencing the host also significantly impact the chemical composition and safety of Chaga [59]. Given these complexities, adhering to stringent safety and health regulations is critical to ensure the safety and efficacy of Chaga products [59].

Further toxicological studies are necessary to authenticate their safety and support their application in treating various conditions [59]. To improve and guarantee the quality of Chaga products (health food or pharmacological products) the brands must have implemented the ISO22000:2018 and the HACCP methodology [59].

## 5. Conclusion

This narrative review highlights the potential of Chaga in mitigating age-related cellular and molecular decline. Its polysaccharides, triterpenoids, and phenolic compounds have demonstrated significant antioxidant activity, reduced oxidative stress and protected against neurodegenerative processes. Additionally, its immunomodulatory effects suggest benefits in maintaining immune system balance, while its anti-inflammatory properties may contribute to reducing chronic inflammation, a key driver of aging and age-related diseases. These studies provide scientific evidence supporting the relationship between the pharmacological properties of Chaga and healthy aging, highlighting its therapeutic potential in promoting longevity and preventing age-related diseases.

From a naturopathic perspective, Chaga aligns with the principles of supporting the body's intrinsic healing capacity, on the other side, TCM recognizes its potential in promoting balance and for promoting healthy aging and longevity.

Despite its promising health benefits, challenges remain regarding the sustainable sourcing, standardization, and bioavailability of Chaga-based products. Further research

is necessary to elucidate its precise mechanisms of action, optimal dosages, and long-term effects on human health. Nevertheless, the evidence reviewed suggests that Chaga may serve as a valuable natural ally in promoting healthspan, warranting further scientific exploration and integration into complementary medicine practices.

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*Review*

# Acupuncture, Moxibustion and Phytotherapy on the treatment of Female Infertility: A Scoping Review.

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**Abstract:** Background: Infertility, characterized by the inability to conceive through natural means, poses substantial medical, psychosocial, and economic challenges. Conventional treatments, including medication and assisted reproductive technologies, often entail adverse effects and financial burdens.
Objective: The aim of this review is to identify, examine, and summarize available evidence about the treatment of female infertility with acupuncture, moxibustion and phytotherapy, and identify gaps in knowledge and research, in order to improve future studies and female infertility management.
Results: For this review six databases were searched. Nine randomized controlled trials published between 2017 and 2022 were included, totalling 1440 participants. The interventions demonstrated efficacy, particularly in cases of Polycystic Ovary Syndrome, through improvements in pregnancy rates, hormonal balance, and quality of life. The therapeutic approaches were phytotherapy (n=4), acupuncture (n=3), acupuncture and phytotherapy (n=1) and moxibustion (n=1). Two of the studies that used only phytotherapy had a higher pregnancy rate. There was a higher pregnancy rate in the combined therapy group (letrozole + eletroacupuncture combined with ginger-isolated moxibustion). The study that combined phytotherapy with acupuncture showed a higher pregnancy rate compared to the sham acupuncture group. In the moxibustion study, there was a higher pregnancy rate in the observational group (moxibustion + clomiphene citrate) compared to the control group (clomiphene citrate). However, methodological limitations, small samples, and short study durations highlight the need for more rigorous research. Customization based on menstrual cycle stages emerged as a critical consideration.
Conclusion: Acupuncture, moxibustion and phytotherapy, when integrated with conventional treatments, holds the potential for enhancing fertility outcomes, emphasizing the importance of a patient-centred, individualized approach.

**Keywords:** Female Fertility; Female Infertility; Traditional Chinese Medicine; Acupuncture; Herbal Medicine; Moxibustion.

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## 1. Introduction

Infertility refers to the inability of an individual to conceive through natural means. In general, this condition is not the typical state for a healthy adult [1,2]. Specifically, female infertility is defined as the inability of a woman to become pregnant after one year of regular unprotected sexual intercourse [3]. It is a multifaceted disorder with considerable medical, psychosocial, and economic implications [4].

The escalating number of infertility cases places a substantial economic burden, with medical expenses rising annually. According to the World Health Organization [5], female

infertility is a global health concern, affecting not only the overall fertility rate but also the population growth rate.

Female infertility can stem from various factors, including menstrual abnormalities, endometriosis, pelvic adhesions, ovulatory disorders, tubal blockage, hyperprolactinemia, and uterine abnormalities [5,6]. Specific conditions like congenital gonadal dysgenesis, hyperprolactinemia, decreased ovarian reserve (DOR), polycystic ovarian syndrome (PCOS), luteinized unruptured follicle syndrome (LUFS), and chronic anovulation are main contributors to infertility [7].

Common therapeutic methods for infertility include medical treatments and complementary and alternative medicine (CAM) [8]. Medical treatments may involve fertility medications, surgery, in vitro fertilization (IVF), or other assisted reproductive technologies (ART) [9-12]. Medications used in clinic commonly include clomiphene citrate (CC), human chorionic gonadotropin (hCG), follicle-stimulating hormone (FSH), human menopausal gonadotropin (hMG), gonadotropin-releasing hormone (GnRH), GnRH analogs, bromocriptine, and cabergoline [13-19].

However, these medications have various physical and psychological adverse reactions, such as breast tenderness, swelling, rash, mood swings, depression, nausea, vomiting, headache, bone density loss and so on [20,21]. Furthermore, IVF treatment is expensive, emotionally, and financially, for both the patients and the public [22]. In light of this, there is a pressing need for alternative approaches, such as Traditional Chinese Medicine (TCM).

Originating in ancient China and spanning over 5000 years, TCM is grounded in philosophical principles like *Yin-Yang* and *Qi*-blood, the Five Elements, Meridian system, and *Zang Fu* organ theory [23].

*Yin-Yang* symbolizes two opposing yet interconnected forces that harmoniously balance to maintain homeostasis. An imbalance in *Yin* and *Yang* disrupts this equilibrium, leading to the onset and progression of diseases [23].

TCM encompasses traditional therapies like acupuncture, herbal medicine, moxibustion, *tui na*, and *qigong* [24-29].

Several studies have explored the impact of various TCM methods on infertility, showing effectiveness in improving fertility indicators such as endometrial receptivity, oocyte and embryo quality, pregnancy rate, hormone levels, ovarian reserve, and menstrual conditions and symptoms [30-35].

However, to ensure the reliability, quality, and precision of these findings, more robust research is essential. Many studies focus on specific pathologies and fertility indicators without necessarily establishing the true effectiveness of TCM in terms of pregnancy and birth rates, often lacking adequate duration and follow-up. Additionally, understanding how different TCM techniques can be used alone or in combination to enhance outcomes is crucial.

This scoping review aims to systematically identify, examine, and summarize existing evidence on the treatment of female infertility with acupuncture, moxibustion and phytotherapy. It seeks to identify knowledge gaps, improve future studies, and explore more effective approaches to managing female infertility. The research questions guiding this review are: (1) Which of these TCM methods are more commonly used for infertility treatment and their associated pregnancy rates?; (2) What is the overall effectiveness of these TCM methods in addressing infertility?; (3) Are there benefits to combining different TCM methods for female infertility treatment?; (4) Which acupoints are most commonly used for female infertility treatment, and what is their efficacy?; and (5) Which plants are frequently used for female infertility treatment, and what is their efficacy?

## 2. Methods

### *2.1. Protocol and registration*

A scoping review is a form of knowledge synthesis that employs a systematic approach to chart existing evidence on a particular topic, aiming to identify key concepts, theories, sources, and areas of knowledge gaps [36].

For our scoping review, we followed the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist. To ensure transparency and accountability, we performed a pre-registration of the review, which was thoroughly reviewed by our research team and conducted on Open Science Framework on August 20, 2022.

### *2.2. Eligibility criteria*

In our review, we considered studies that met the following inclusion criteria: they were published between 2017 and 2022; classified as Clinical Trials or Randomized Controlled Trials; written in either English or Portuguese; included female participants diagnosed with infertility according to World Health Organization (WHO) guidelines; and had female pregnancy and/or live births as the primary outcome. To ensure that the treatment outcomes were not influenced by IVF, studies involving women undergoing IVF were excluded from our analysis.

### *2.3. Information sources, Literature search and Selection of sources of evidence*

A comprehensive search was conducted across six electronic databases, including PubMed, Cochrane Central Register of Controlled Trials, SciELO, LILACS, Science Direct, and Web of Science. The protocol was devised by the research team and can be accessed in OSF (https://doi.org/10.17605/OSF.IO/42MA7). The keywords used were: ((*female fertility*) OR (*female infertility*)) AND ((*acupuncture*) OR (*herbal medicine*) OR (*moxibustion*) OR (*Chinese traditional medicine*)).

The search results were exported to Rayyan [37], where duplicates were removed by one of the team researchers. Two reviewers from the team independently screened the same 228 publications directly within Rayyan, evaluating titles, abstracts, and subsequently the full text of each publication. In instances of discrepancies regarding study selection and data extraction, consensus was reached through discussions between the reviewers, and involvement of other team members was sought if required.

### *2.4. Data charting*

Two reviewers from the research team collaborated to create a data-charting form, which was used to assess the eligibility of the selected studies for the review and to identify the relevant variables to be extracted. Independently, the two reviewers charted the data from the selected studies, then engaged in discussions to compare their findings and ensure accuracy. Throughout the process, the data-charting form was regularly updated in an iterative manner to incorporate new insights and maintain coherence.

### *2.5. Data items*

Data abstraction was performed, covering the following aspects: author, year of publication, research aim, sample size, specific infertility pathology, utilized treatments (acupuncture, phytotherapy, moxibustion, or a combination of acupuncture and phytotherapy), evaluated parameters, acupoints and/or plants used in the treatments, main findings, and study quality.

To assess the study quality, we employed the Downs and Black Scale. This checklist provides a comprehensive critical appraisal tool suitable for public health practitioners, policy-makers, and decision-makers. It offers a step-by-step and user-friendly assessment applicable to all quantitative study methodologies.

For this purpose, we utilized the revised version of the Downs *et al.* [38] checklist, which is specifically designed to evaluate the methodological quality of randomized studies in the field of health care interventions.

*2.6. Critical appraisal of individual sources of evidence*

The Downs and Black Scale comprises 27 questions that assess various aspects of study quality, including reporting quality (10 questions), external validity (3 questions), internal validity (bias and confounding) (13 questions), and statistical power (1 question). Internal consistency for the total score and all subscales has been shown to be high (Kuder-Richardson 20 test: 0.89), except for external validity (0.54). The reliability of the subscales ranges from "good" for bias to "poor" for external validity [38].

The original scale yields a total score out of 32 points, with one question in the reporting section carrying a possible two points and the statistical power question carrying a possible five points. In some studies, researchers have used a modified version of the scale by simplifying the power question. In this modified version, a single point is awarded if a study had sufficient statistical power to detect a clinically significant effect, indicated by a probability value of less than 5% for a difference being due to chance [39].

The modified version which we employed in this study therefore has a maximum score of 28. Each paper was assigned a grade of "excellent" (24–28 points), "good" (19–23 points), "fair" (14–18 points) or "poor" (<14 points).

*2.7. Synthesis of data collection*

The data were continuously charted in interactive tables, facilitating ongoing updates and revisions. These tables were shared among the review team members, fostering collaboration and enabling a comprehensive synthesis of the findings. Through regular discussions and exchanges, the team worked together to analyze and interpret the data effectively.

**3. Results**

For this scoping review, a thorough search was conducted across six databases, resulting in a total of 308 articles and 1440 participants. Through a series of selection stages, the research team narrowed down the articles, eventually retaining nine that met the inclusion criteria. The entire process, including the reasons for exclusions at each stage and the final selections, is illustrated in detail in Figure 1.

As it can be observed in Table 1, amongst the final nine articles, four of them focused on phytotherapy as a treatment modality [40-43]. Three articles centered around acupuncture [44-46], one article explored the combined use of acupuncture and phytotherapy [47], and one article investigated the effectiveness of moxibustion [48]. Notably, some studies incorporated electroacupuncture in their treatment protocols [45,46].

As reported in Table 2, Polycystic Ovary Syndrome (PCOS) emerged as the most commonly discussed pathology, featuring in five out of the nine articles [40,45-48]. However, other pathologies were also addressed in the selected studies. These included Decreased Ovarian Reserve (DOR) [41], hyperprolactinemic Infertility [42], Premature Ovarian Aging (POA) [43], and Premature Ovarian Failure (POF) of autoimmune etiology [44].

The average sample size across the nine studies was approximately 160 participants, although this number was somewhat influenced by one article with a larger sample size of 926 women [46]. Excluding this study, the average sample size would be around 64 participants. The smallest sample size in any study was 24, while the largest was 926. Overall, the nine studies involved a total of 1440 female participants, ranging in age from 18 to 40 years.

Regarding the location of the studies, the majority of them (n=6) were conducted in China [41,42,45-48]. Two studies were conducted in Iran [40,43], and one study was carried out in Egypt [44]. The studies were primarily conducted in hospital facilities, with the exception of one study that took place at a university [44].

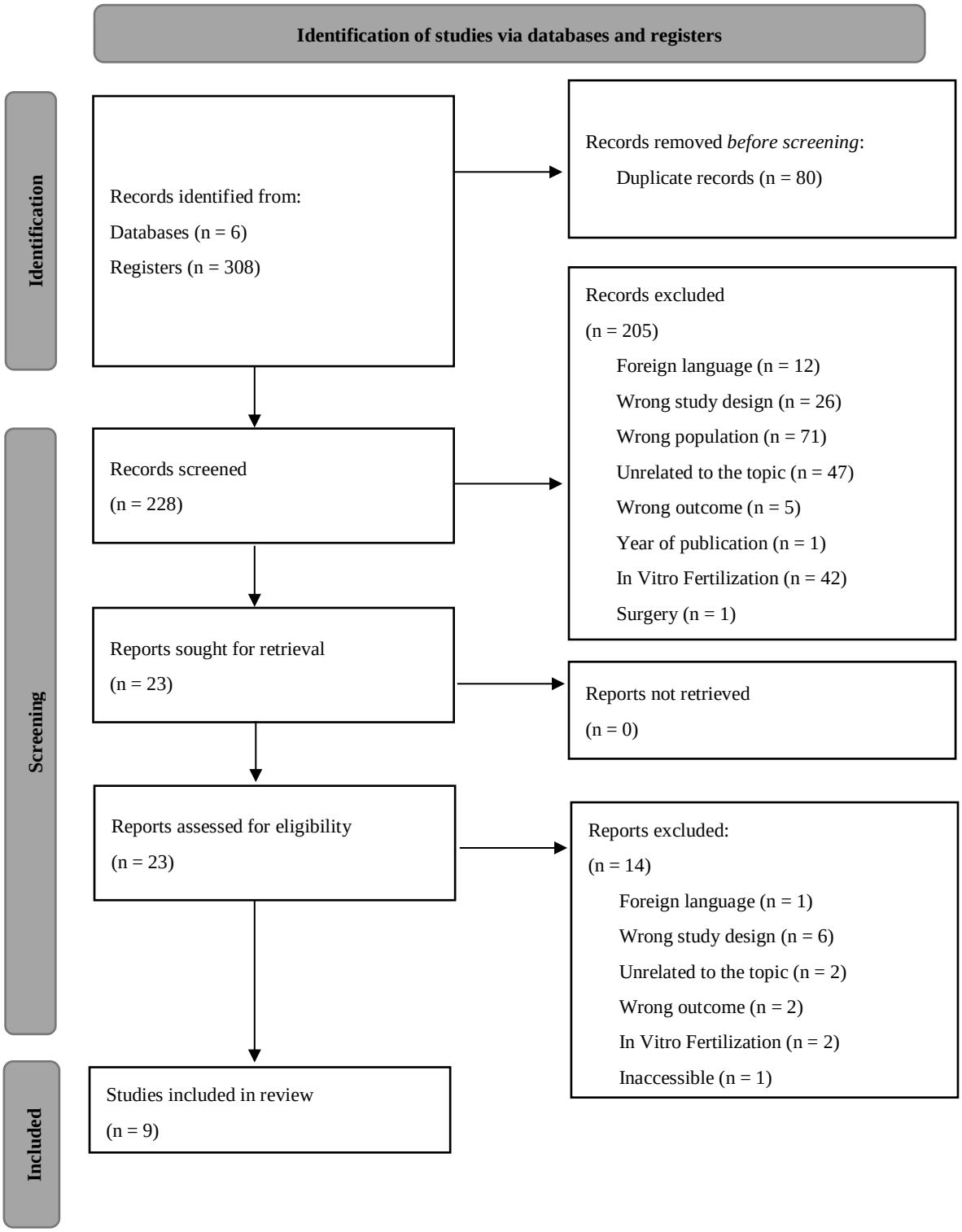


Figure 1. Flow Diagram.

All nine articles in this scoping review utilized the same study design - they were all randomized controlled trials (RCTs). This commonality was expected, as one of the inclusion criteria for the review was to include RCTs or clinical trials. Reported in Table 1, among the selected studies, three were single-blind RCTs [40,41,47], one was a double-blind RCT [43], and another had a combination of single-blind (active vs. control acupuncture) in two groups and double-blind (clomiphene vs. placebo) in two other groups [46]. The remaining four studies were non-blinded RCTs [42,44,45,48].

Table 1. Techniques, study design and quality of the included research.

| Method | Authorship | Study design | Sample Size | Study Quality |
|---|---|---|---|---|
| Phytotherapy (n=4) | Ainehchi *et al.* [40] | Single-blind randomized clinical trial | 60 | Good |
| | Duan *et al.* [41] | Prospective, randomized-controlled trial | 80 | Good |
| | Feng *et al.* [42] | Pilot randomized controlled trial | 77 | Good |
| | Hossein-Rashidi *et al.* [43] | Randomized, placebo-controlled clinical double-blind trial | 61 | Excellent |
| Acupuncture (n=3) | Dawood *et al.* [44] | Pilot, non-blinded, randomized controlled trial. | 24 | Good |
| | Qiu-Ping *et al.* [49] | Randomized controlled trial. | 65 | Good |
| | Wu *et al.* [46] | Randomized, multicenter, clinical double-blind (clomiphene vs. placebo) and single-blind (active vs. control acupuncture) trial. | 926 | Excellent |
| Acupuncture + Phytotherapy (n=1) | Pan *et al.* [47] | Randomized, sham-controlled single-blind (patients, outcome assessors, data collectors, and statisticians) trial. | 79 | Excellent |
| Moxibustion (n=1) | Ye *et al.* [48] | Randomized controlled trial. | 68 | Good |

Regarding the details of the TCM treatments, such as the duration of each session (e.g., time of needle retention) or the overall duration of therapy and dosages, some articles lacked clarity or omitted this information [40,42-44,46-48]. Based on the available data, the average total treatment time mentioned in each article was approximately 3.56 months or menstrual cycles. Despite some inconsistencies in reporting, this average duration provides an overall understanding of the treatment periods across the selected studies.

Table 2. Characteristics and methodology of the included studies.

| Authorship | Cause of infertility | Objective | Acupuncture points or Plants Used | Evaluated Parameters |
|---|---|---|---|---|
| Ainehchi *et al.* [40] | Polycystic ovary syndrome (PCOS) | To evaluate the effect of herbal mixture alone and combined with clomiphene on serum antioxidants, glycemic status, menstrual regulation, and pregnancy rate | *Mentha spicata* 250 mg, *Zingiber officinale* 200 mg, *Cinnamomum zeylanicum* 150 mg, and *Citrus sinensis* 100 mg | Pregnancy rate; serum antioxidants; glycemic status; menstrual regulation. |
| Duan *et al.* [41] | Decreased ovarian reserve (DOR) | To evaluate the effect of sequential therapy for Kidney-tonifying with TCM on improving the fecundity and quality of life. | Zhuyun Tang and Guchong Tang<br>Zhuyun Tang: *Semen cuscutae* 12-30 g, *Fructus lycii* 15 g, *Fructus rubi* 15 g, *Morinda officinalis* 12 g, *Herba epimedii* 10 g, *Cornu cervi* 10 g, *Radix dipsaci* 10 g, *Cortex eucommiae* 12 g, *Mulberry* 15 g, *Polygonum multiflorum* 10-20 g, *Fluoritum* 30 g, *Angelica biserrata* 6 g.<br>Guchong Tang: *Semen cuscutae* 12-30 g, *Fructus lycii* 12-20 g, *Fructus rubi* 12-20 g, *Morinda officinalis* 12 g, *Herba epimedii* 10 g, *Cornu cervi* 10 g, *Radix dipsaci* 12 g, *Cortex eucommiae* 10 g, *Eclipta prostrata* 20 g, *Fructus ligustri lucidi* 10-20 g, *Rhizoma dioscoreae* 15 g | Kupperman indices; hormone levels; ovarian reserve functions; questionnaire (MENQOL) scores; pregnancy rate. |
| Feng *et al.* [42] | Hyperprolactinemic infertility | To evaluate the effect of bu-shen-zhu-yun decoction combined with bromocriptine on | Bu-shen-zhu-yun decoction:<br>Deer horn slices 10 g, | Prolactin (PRL) and kisspeptin (KP) serum indexes; anxiety self-assessment scale (SAS) and insomnia severity index |

| | | | | |
|---|---|---|---|---|
| | | serum hormones, anxiety, and pregnancy rate. | Violet quartz 10 g, dens *draconis* 20 g; *Radix paeoniae alba* 12 g, fried *Rizhoma discoreae* 18 g, vinegared *Radix bupleuri* 9 g, *Radix salviae miltiorrhizae* 10 g, Gambir plant 10 g, *Semen cuscutae* 18 g, *Fructus corni 12 g*<br>The decoction was mixed and taken orally twice daily (morning and evening) but suspended during menstruation. | scale (ISI) scores; pregnancy rate. |
| Hossein-Rashidi *et al.* [43] | Premature ovarian aging (POA) | To evaluate the effects of vitex agnus-castus extract on fertility, secretory functions of the pituitary-gonadal axis, and reproductive potential. | *Vitex agnus-castus* (VAC) extract - 40 drops of VAC (80-90 mg of fruit per milliliter extract) orally in the morning on an empty stomach for 4 months throughout the follicular phase. | Ovulation days; endometrial thickness; serum concentrations of follicle-stimulating hormone (FSH), anti-mullerian hormone (AMH), and estradiol (E2); the average time of serum positive ß-HCG test; chemical and clinical pregnancy rates. |
| Dawood *et al.* [44] | Premature ovarian failure (POF) of autoimmune etiology | To evaluate the efficacy of live bee stings at fertility points and acupuncture in treating symptoms and managing infertility. | Epangxian II, GV26 (Shuigou), EX-HN 3, LR 14 (Qimen), CV 14 (Juque), CV 12 (Zhongwan), KI 16 (Huangshu), CV 6 (Qihai), CV 19 (Zigong), CV 4 (Guanyuan), CV 3 (Zhongji), ST 30 (Qichong), BL44 (Shentang), BL15 (Xinshu), BL17 (Geshu),<br>BL23 (Shenshu), BL31 (Shangliao), BL32 (Ciliao), BL33 (Zhongliao), LI4 (Hegu), GB 30 (Huantiao), and BL60 (Kunlun). | Serum concentrations of follicle-stimulating hormone (FSH), luteinizing hormone (LH), estradiol (E2), and anti-mullerian hormone (AMH); frequency and percentage of rheumatoid factor, antithyroid antibodies, lupus antibodies, and anti-ovarian antibodies; menopausal, psychological, and sex-related symptoms; ultrasound to assess antral follicle count and ovarian volume; pregnancy rate. |
| Qiu-Ping *et al.* [49] | Polycystic ovary syndrome (PCOS) | To evaluate the effect of electro-acupuncture combined with ginger-isolated moxibustion on endometrial receptivity. | Acupuncture in menstrual period: EX-CA1 (Eletroacupuncture (EA)), ST29 (EA), SP6, LR3, and LI4;<br>Acupuncture in follicular phase: CV6, KI12 (EA), Luanchao (extra, ovary) (EA), SP6 (EA), ST36 (EA), and KI3; ginger-isolated moxibustion: CV4 and CV8;<br>Acupuncture in the ovulatory period: Luanchao (extra, ovary) (EA), GB27 (EA), CV6 (EA), CV3 (EA), SP10 (EA), SP6 (EA), LI4, and LR3;<br>Acupuncture in luteal phase: EX-CA1 (EA), SP10 (EA), ST36 (EA), SP6, and KI3; ginger-isolated moxibustion CV4. | Symptom score of TCM; endometrial thickness and morphology; the number of ovulation cycles; bilateral uterine artery pulsatility index (PI); resistance index (RI); the sum of peak systolic velocity/end diastolic velocity (S/D); pregnancy rate. |
| Wu *et al.* [46] | Polycystic ovary syndrome (PCOS) | To evaluate if active acupuncture, alone or combined with clomiphene, increases the number of live births. | Active acupuncture protocol 1: GV20, CV6, CV3, bilateral ST29, bilateral SP9, bilateral SP6, and bilateral LI4 (all connected to an electrical stimulator, except the GV20 and bilateral LI4);<br>Active acupuncture protocol 2: GV20, CV6, CV3, bilateral ST25, bilateral ST29, bilateral PC6, bilateral SP6, and bilateral LR3 (bilateral ST25, bilateral ST29, bilateral SP6, and bilateral LR3, were connected to an electrical stimulator). | Primary outcome: live birth. Secondary outcomes: ovulation; conception; pregnancy, pregnancy loss; multiple pregnancies; anthropometrics; hirsutism; acne; hormonal changes (progesterone, total testosterone, estradiol, and sex hormone–binding globulin); |

| | | | | |
|---|---|---|---|---|
| | | | | quality-of-life scores (Polycystic Ovary Syndrome Health-Related Quality of Life Questionnaire; Chinese Quality of Life Instrument; Medical Outcomes Study 36-Item Short Form Health Survey; Zung Self-Rating Anxiety Scale; Zung Self-Rating Depression Scale); adverse events. |
| Pan *et al.* [47] | Polycystic ovary syndrome (PCOS) | To evaluate the efficacy of acupuncture combined with herbal medicine. | Phytotherapy: Taohong siwu decoction (in menstrual period); Bushen tiaojing decoction (non-menstrual periods for Spleen-Kidney Yang deficiency); guishao dihuang decoction (non-menstrual periods for Liver-Kidney deficiency).<br>Acupuncture (13 points maximum):<br>- Main points: RN4, bilateral EX- CA1, ST29, ST36, and SP6.<br>- Points selected based on the syndrome differentiation and the menstrual cycle: RN6, RN12, DU20, bilateral ST25, KI3, KI6, LR3, SP10, and PC6. | Primary outcome: pregnancy rate.<br>Secondary outcomes: ovulation rate; PCOS and TCM syndrome scores; serum sex hormone levels like estradiol (E2), testosterone (T), progesterone (P), luteinizing hormone (LH), and follicle-stimulating hormone (FSH); insulin resistance index. |
| Ye *et al.* [48] | Polycystic ovary syndrome (PCOS) | To evaluate the effects and related mechanism of heat-sensitive moxibustion combined with clomiphene citrate capsules for infertility. | Heat-sensitive moxibustion at the points: CV4 and bilateral EX-CA1, SP10, and BL23. | Endometrial thickness; ovarian volume; levels of serum sex hormones (testosterone (T), luteinizing hormone (LH), estradiol (E2)); tumor necrosis factor-$\alpha$ (TNF-$\alpha$), and nuclear factor-κB (NF-κB); pregnancy rate. |

Follow-up time (reported in Table 3) was mentioned in all of the studies except for Qiu-Ping *et al.* [45]. Across the remaining articles, the average follow-up duration was approximately 8.88 months. This follow-up period allowed researchers to observe the effects of the TCM treatments on the participants' fertility outcomes over an extended period of time. The varying follow-up durations provide valuable insights into the long-term effectiveness and sustainability of the treatments in addressing female infertility.

Indeed, the results of the selected studies exhibited some variability, reflecting the diversity of TCM treatments and the different infertility pathologies investigated. However, certain parameters were consistently evaluated across multiple studies, providing valuable insights into treatment outcomes. One such universal parameter was the rate of female pregnancy and/or live births, which was a crucial eligibility criterion for our review. This direct and objective measure served as a clear indicator of treatment effectiveness and was easy to interpret.

Additionally, several other commonly assessed parameters included hormone levels such as testosterone, luteinizing hormone, estradiol, follicle-stimulating hormone, and/or anti-mullerian hormone. These hormone levels play a pivotal role in the regulation of the reproductive system and provide crucial insights into the hormonal status of the participants during treatment [50-52].

Furthermore, endometrial thickness and ovulation were frequently monitored to gauge the effects of the TCM interventions on the participants' reproductive health. These

measures were particularly relevant for assessing improvements in the uterine environment and the regularity of ovulation, both essential factors for successful conception [53-56].

Table 3. Groups of study, timeline and follow-up.

| Authorship | Group of study | Timeline | Follow-up |
|---|---|---|---|
| Ainehchi *et al.* [40] | Group 1 – Clomiphene citrate (50-150 mg) | The administration started on the fifth day of the menstrual cycle and continued for 5 days, for 3 menstrual cycles. | 9 months |
| | Group 2 – Herbal mixture (700 mg) | Daily. | |
| | Group 3 – Clomiphene citrate (50-150 mg) with herbal mixture (700 mg) | Clomiphene citrate administration started on the fifth day of the menstrual cycle and continued for 5 days, for 3 menstrual cycles; herbal mixture daily; for 3 months. | |
| Dawood *et al.* [44] | Group I – Acupuncture | Once every other day, 3 sessions per week – alternating between the points in the frontal region with the dorsal region, for 3 months. | 1 year after treatment |
| | Group II – Bee stings | 2 sessions per week (15 minutes each) – in fertility points on the back and abdomen, 3 to 6 stings per session, for 3 months. | |
| Duan *et al.* [41] | Control group - Estrogen (1 mg/time) and progesterone (dydrogesterone) (10 mg/time) | Estrogen started on the fifth day of the menstrual cycle and continued for 21 days, once a day; dydrogesterone started on the twelfth day and continued for 10 days, 2 times per day; for 3 menstrual cycles. | 1 year |
| | Test group – Zhuyun tang (157-185 g) and guchong tang (135-179 g) | Zhuyun tang started on the fifth day of the menstrual cycle and continued for 10 days, once a day; guchong tang started on the fifteenth day and continued for 12 days, once a day; for 3 menstrual cycles. | |
| Feng *et al.* [42] | Control group – Bromocriptine (2,5-3,75 mg/day to 10-20 mg/day) | The administration started after menstruation, 2 to 3 doses per day (the dosage was increasing according to the diagnosis), for 3 months. | 6 months |
| | Observation group – Bromocriptine (2,5-3,75 mg/day to 10-20 mg/day) and bu-shen-zhu-yun decoction (129 g) | Bromocriptine started after menstruation, 2 to 3 doses per day (the dosage was increasing according to the diagnosis); the decoction was taken twice a day and was suspended during menstruation; for 3 months. | |
| Qiu-Ping *et al.* [49] | Western medication group – Letrozole (5 mg/day) | The administration started on the third day of the menstrual cycle, and continued for 5 days, once per day, for 3 menstrual cycles. | N/A |
| | Combined therapy group – Letrozole (5 mg/day) and electroacupuncture with ginger isolated moxibustion | Letrozole started on the third day of the menstrual cycle, and continued for 5 days, once per day; electroacupuncture and moxibustion were made on the menstrual period, follicular phase, ovulatory period, and luteal phase in different acupoints, once every two days, 30 minutes each time; for 3 menstrual cycles. | |
| Pan *et al.* [47] | Manual acupuncture group – Herbal medication with manual acupuncture | Herbal medication was taohong siwu decoction on menstrual period, and on non-menstrual period it was bushen tiaojing decoction or guishao dihuang decoction, according to the diagnostic, 2 times per day; acupuncture was made 2 times at a week for 30 minutes each session (no more than 13 acupoints at a time); the treatments started on the third day of menstrual cycle and continued until the third day after ovulation; for 3 menstrual cycles. | 24 weeks after treatment |
| | Sham acupuncture group – Herbal medication with sham acupuncture | Herbal medication was taohong siwu decoction on menstrual period, and on non-menstrual period it was bushen tiaojing decoction or guishao dihuang decoction, according to the diagnostic, 2 times per day; acupuncture was made 2 times at a week for 30 minutes each session (no more than 13 acupoints at a time); the treatments started on the third day of the menstrual cycle, and continued until the third day after ovulation; for 3 menstrual cycles. | |
| Wu *et al.* [46] | Group 1 – Active acupuncture (maximum 32 treatments) plus clomiphene citrate (maximum 150 mg/day or 750 mg/cycle) | Active acupuncture (deep needle with manual and electrical stimulation every 10 minutes), was 2 times per week started on the third day of the menstrual cycle, 30 minutes each session; 1 pill of clomiphene citrate (50 mg) started on the third day of the menstrual cycle and continued until the seventh day (5 days), for 4 cycles (if ovulation didn't occur, the dose was increased to one more pill, the maximum dose being 150 mg per day | 10 months after treatment |

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|---|---|---|---|
| | | or 750 per cycle) (patients who didn't menstruate took medroxyprogesterone acetate (5 mg/day) for 10 days, to induce withdrawal bleeding). | |
| | Group 2 – Control acupuncture (maximum 32 treatments) plus clomiphene citrate (maximum 150 mg/day or 750 mg/cycle) | Control acupuncture (superficial needle and no stimulation, just mock electricity) was 2 times per week, started on the third day of the menstrual cycle, 30 minutes each session; 1 pill of clomiphene citrate (50 mg) started on the third day of the menstrual cycle and continued until the seventh day (5 days), for 4 cycles (if ovulation didn't occur, the dose was increased to one more pill, the maximum dose being 150 mg per day or 750 per cycle) (patients who didn't menstruate took medroxyprogesterone acetate (5 mg/day) for 10 days, to induce withdrawal bleeding). | |
| | Group 3 – Active acupuncture (maximum 32 treatments) plus placebo | Active acupuncture (deep needle with manual and electrical stimulation every 10 minutes), was 2 times per week started on the third day of the menstrual cycle, 30 minutes each session; 1 pill of placebo started on the third day of the menstrual cycle and continued until the seventh day (5 days), for 4 cycles (patients who didn't menstruate took medroxyprogesterone acetate (5 mg/day) for 10 days, to induce withdrawal bleeding). | |
| | Group 4 – Control acupuncture (maximum 32 treatments) plus placebo | Control acupuncture (superficial needle and no stimulation, just mock electricity) was 2 times per week, started on the third day of the menstrual cycle, 30 minutes each session; 1 pill of placebo started on the third day of the menstrual cycle and continued until the seventh day (5 days), for 4 cycles (patients who didn't menstruate took medroxyprogesterone acetate (5 mg/day) for 10 days, to induce withdrawal bleeding). | |
| Hossein-Rashidi *et al.* [43] | Control group – Letrozole (1 pill - 5 mg) | The administration started on the third day of the menstrual cycle and continued for 4 days; when the follicle reached 18-20 mm, the patient received 10,000 IU of human chorionic gonadotropin (HCG) intramuscularly. | 4 months |
| | Experimental group - Vitex agnus-castus extract (VAC) (80-90 mg of fruit/ml extract) | Administration of 40 drops of VAC throughout the follicular phase, for 4 months. | |
| Ye *et al.* [48] | Control group – Clomiphene citrate capsules (50 mg/time) | The administration started on the fifth day of the menstrual cycle, and continued for 5 days, once a day, for 6 menstrual cycles. | 1 year after treatment |
| | Observation group – Clomiphene citrate capsules (50 mg/time) and heat-sensitive moxibustion | Clomiphene started on the fifth day of the menstrual cycle, and continued for 5 days, once a day; heat-sensitive moxibustion on alternate days (after the patient felt heat-sensitive (heat-sensitive point) moxibustion was performed at this point for another 10 minutes until the heat sensitization disappeared). | |

Interestingly, some studies went beyond solely evaluating physical parameters and also assessed patients' quality of life using various methods [41,42,44,46]. This approach is highly relevant as infertility can profoundly affect individuals' mental and emotional well-being [57-59]. Evaluating the quality of life of the participants provided a more comprehensive understanding of how these TCM treatments can address not only the physical aspects of infertility but also its psychosocial effects. This holistic approach acknowledges the complex relationship between infertility and quality of life, emphasizing the importance of addressing both aspects to achieve successful outcomes in infertility management.

The reporting of side effects associated with the treatments varied among the studies. In some articles, the side effects were not mentioned [42,46]. On the other hand, in several studies, no adverse reactions were reported [40,47,48], or they were not specifically identified in the article [45]. Moreover, in the studies where side effects were reported, they were mostly not statistically significant [41,44].

After analyzing the articles, it became evident that some conventional therapies were used in several of the studies. Three of these conventional therapies were particularly

noteworthy: bromocriptine, clomiphene citrate, and letrozole. Table 1 provides a brief analysis of the use and significance of these conventional therapies, shedding light on their role and effectiveness in the management of female infertility.

Table 4. Conventional therapies.

| **Conventional therapies** | Bromocriptine | Clomiphene citrate | Letrozole |
|---|---|---|---|
| **Studies where they were used** | Feng et al. 42. | Ainehchi et al. 40,Wu et al. 46,Ye et al. 48 | Hossein-Rashidi et al. 43,Qiu-Ping et al. 49. |
| **Designation** | It acts as a dopamine receptor, controlling the levels of prolactin and sex hormones, and having an effect on ovulation and the menstrual cycle Feng et al. 42. | It binds to estrogen receptors and suppresses endometrial estrogen. It increases endometrial thickening, stimulates ovulation and the secretion of gonadotropin-releasing hormone (Ainehchi et al., 2019). | It is an aromatase inhibitor (an enzyme that converts testosterone into estrogen), promotes ovulation (Amer et al., 2017). |
| **Situations/pathologies in which it is normally used** | Hyperprolactinemia Feng et al. 42. | It is a first-line treatment to induce ovulation in Polycystic Ovary Syndrome (PCOS). Also indicated in other situations where it is necessary to increase LH and FSH gonadotropin levels Ainehchi et al., 2019; Tie-Jun Ye; Hong-Xia Cheng, 2020; Wu et al., 2017). | Polycystic Ovary Syndrome (PCOS) (Lin et al., 2022). |
| **Common side effects** | Nausea, vomiting, vertigo and somnolence.<br>There are other side effects more serious, but they are not so common Feng et al. 42. | Anovulation rate 23.4%, live birth rate 19.1%, and multiple pregnancy rate 7.4% after 5 months of therapy. Dysmenorrhea and excessive enlargement of the ovaries and formation of ovarian cysts (Pan et al., 2022; Wu et al., 2017). | Low pregnancy rate and high early miscarriage rate.<br>Very common adverse effects: hypercholesterolemia, hot flushes, hyperhidrosis, arthralgia, fatigue, and asthenia, among many others (Lin et al., 2022; Mejia et al., 2019; Zhang et al., 2022). |

## 4. Discussion

The current scoping review provides insights into the evidence of acupuncture, moxibustion and phytotherapy techniques for treating infertility. This scoping review uncovered that phytotherapy, acupuncture, moxibustion, and electroacupuncture are commonly employed TCM methods for treating infertility.

### *4.1. Acupuncture, moxibustion and phytotherapy in pregnancy rates*

Overall, the studies provided justifications for the effectiveness of these TCM methods in infertility treatment, revealing higher pregnancy rates ($p<0.05$) in groups that utilized these methods compared to those relying solely on medication. The main results of these studies are depicted in Table 5.

However, the results of Dawood *et al.* [44] and Wu *et al.* [46] studies indicated that acupuncture might not be as effective as other methods in increasing pregnancy rates. This discrepancy could be attributed to the lack of adaptation of acupuncture protocols to the menstrual cycle of women. Moreover, it is essential to consider that although clomiphene appears to be more effective than acupuncture in enhancing pregnancy rates according to the Wu et al.'s study, its usage may be limited due to associated side effects. For example, a systematic review [60] showed evidence of significant effectiveness of acupuncture intervention for infertile women without undergoing assisted reproductive techniques in pregnancy rate, ovulation rate, LH, and endometrial thickness compared with control group

(that only used standard therapies, such as injected Western drugs and oral Western medication).

Table 5. Main results of the included studies.

| Authorship | Main results |
|---|---|
| **Ainehchi *et al.*** [40] | The ultrasound showed no significant differences after treatment in the number and size of follicles and the size of the ovaries.<br>The oligomenorrhea rate was reduced in all groups after treatment.<br>The group where more women were ovulating and becoming pregnant was the group where the herbal mixture was given along with clomiphene citrate (17 women had dominant follicles and 5 of them became pregnant); against the group where only the herbal mixture was given, 11 women had dominant follicles and 2 of them became pregnant.<br>Total: 11 pregnancies. Group 1= 4 (20%); Group 2= 2 (10%); Group 3= 5 (25%)<br>In the 3 groups, there was a regulation of the menstrual cycle, ovulation, and pregnancy. |
| **Duan *et al.*** [41] | The levels of follicle-stimulating hormone (FSH), luteinizing hormone (LH) and ovarian stromal resistance index decreased significantly in the group that received the phytotherapy (test group) (P<0.001).<br>Levels of estradiol (E2), anti-mullerian hormone (AMH), mid-luteal phase E2, progesterone, antral follicular count, and ovarian diameter increased significantly in the test group (P<0.001).<br>Quality of life significantly improved in the test group compared to the control group (Kupperman indices and MENQOL scores were lower in the test group) (P<0.001).<br>The pregnancy rate was higher in the test group (19 pregnancies versus 10 in the control group) (*P*<0.05). |
| **Feng *et al.*** [42] | Serum levels of PRL, SAS, and ISI scores were significantly lower in the observation group (bu-shen-zhu-yun decoction combined with bromocriptine) than in the control group (bromocriptine) (*P*<0.05).<br>The pregnancy rate was higher in the observation group (*P*=0.031) where there were also fewer early miscarriages (*P*=0.015).<br>Observation group: 25 successful pregnancies, 4 cases of early miscarriage, and 3 cases of serious adverse reactions.<br>Control group: 14 successful pregnancies, 12 early miscarriages, and 9 cases of serious adverse reactions. |
| **Hossein-Rashidi *et al.*** [43] | The AMH levels increased in both groups, but after four months were higher in the experimental group (VAC) (*P*<0.05).<br>In the experimental group, the concentration of FSH and E2 were significantly decreased, as well as the levels of E2 on ovulation day and the average time of serum positive ß-HCG test (*P*<0.05).<br>NIn the group receiving VAC, ovulation day (*P*=0.001), endometrial thickness (*P*<0.05), chemical and clinical pregnancy rates were significantly higher.<br>Chemical pregnancy rate: 25/32 in the experimental group and 10/29 in the control group (letrozole) (*P*=0.001).<br>Clinical pregnancy: 11/32 in the experimental group and 4/29 in the control group (*P*=0.03). |
| **Dawood *et al.*** [44] | In the acupuncture group (group I) there was a significant improvement in associated symptoms, compared to group II (bee stings) (*P*=0.050).<br>In both groups, the levels of FSH and LH decreased, but they went down more in group II, and E2 increased, more in group II (*P*<0.05).<br>The levels of AMH showed no significant differences in both groups (*P*=0.388).<br>In the group of acupuncture, 13 women didn't become pregnant, but had regular menstruation, as well as 11 women in the group of bee stings (*P*=0.361).<br>Pregnancy rate: 8 (5 in group 2 (bee stings) and 3 in the group of acupuncture) (*P*=0.409). |
| **Qiu-Ping *et al.*** [49] | Compared with the western medication group (letrozole), in the combined therapy group (letrozole combined with artificial cycle therapy with isolated ginger moxibustion (electroacupuncture + ginger moxibustion)), there was significant: reduction |

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| | in the symptom score of TCM ($P$<0.01); bilateral uterine pulse reduction ($P$<0.01); resistance index ($P$<0.01) and S/D optimization ($P$<0.01); greater number of ovulatory cycles ($P$<0.01); higher pregnancy rate; lower abortion rate.<br>The endometrial thickness was better in the combined therapy group ($P$<0.01).<br>Clinical pregnancy rate: 18/32 (combined therapy group) and 10/33 (western medication group) ($P$<0.05).<br>Early abortion rate: 1/18 (combined therapy group) and 5/10 (western therapy group) ($P$<0.05). |
| **Wu *et al.*** [46] | The live births were significantly higher in the clomiphene groups, compared to placebo groups (135/471 vs. 70/455). Between the active and control acupuncture, there were no significant differences (100/458 vs. 105/468).<br>Pregnancy rate: 74/235 (active acupuncture plus clomiphene group); 70/236 (control acupuncture plus clomiphene group); 33/223 (active acupuncture plus placebo group); 41/232 (control acupuncture plus placebo group) ($P$=0.37 between active acupuncture and clomiphene treatments).<br>Pregnancy loss/conception: 38/108 (active acupuncture plus clomiphene group); 37/106 (control acupuncture plus clomiphene group); 19/51 (active acupuncture plus placebo group); 16/55 (control acupuncture plus placebo group) ($P$=0.51 between active acupuncture and clomiphene treatments).<br>Live births: 69/235 (active acupuncture plus clomiphene group); 66/236 (control acupuncture plus clomiphene group); 31/223 (active acupuncture plus placebo group); 39/232 (control acupuncture plus placebo group) ($P$=0.39 between active acupuncture and clomiphene treatments). |
| **Pan *et al.*** [47] | Sex hormone level (E2, T, P, LH, and LH/FS) were significantly lower in the phytotherapy combined with the manual acupuncture group (MA group) ($P$<0.05). No significant improvement in FSH level or insulin resistance index. In the phytotherapy combined with the sham acupuncture group (SA group) only the progesterone was reduced ($P$=0.008).<br>The MA group had statistically significant improvement in the PCOS and TCM scores ($P$<0.05).<br>Ovulation rate: 75 (MA group, with 54 no ovulations) and 59 (SA group, with 70 no ovulations) ($P$=0.046).<br>Pregnancy rate: 19/41 (MA group) and 7/38 (SA group) ($P$=0.008). |
| **Ye *et al.*** [48] | In the observation group (clomiphene citrate capsules combined with heat-sensitive moxibustion), endometrial thickness increased significantly, and ovarian volume decreased ($P$<0.05). These results were also verified in the control group (clomiphene citrate capsules) but were better in the observation group ($P$<0.05).<br>The levels of serum hormones T and LH decreased in both groups but were lower in the observation group ($P$<0.05). The E2 also increased in both groups, but more in the moxibustion group ($P$<0.05).<br>The levels of immune inflammatory factor TNF-$\alpha$ and NF-κB of the patients in both groups decreased, although were lower in the observation group ($P$<0.05).<br>Pregnancy rate: 7/35 (control group) and 17/33 (observation group) ($P$<0.05). |

Regarding phytotherapy, the studies conducted by Duan *et al.* [41] and Hossein-Rashidi *et al.* [43] demonstrated higher pregnancy rates in the groups that solely used phytotherapy compared to those using only medication. This finding suggests the effectiveness of phytotherapy in treating infertility. This results are in accordance with the results obtained in the Systematic Review by Ried *et al.* [31] in which they conclude that Traditional Chinese Herbal Medicine is more effective in the treatment of female infertility achieving on average a 60% pregnancy rate over 4 months compared with 30% achieved with standard Western Medical drug treatment, or IVF over 12 months. Additionally, Feng et al.'s [42] study combining phytotherapy with bromocriptine revealed higher pregnancy rates compared to the group using bromocriptine alone, indicating a potential benefit in combining phytotherapy with medication.

As for acupuncture, the study by Dawood *et al.* [44] used acupuncture and bee stings and suggested that both interventions may promote symptom improvement and potentially aid in promoting pregnancy. However, the study did not present statistically significant results, possibly due to its small sample size (n = 30) and the absence of adaptation

of the acupoints according to the menstrual cycle. In contrast, Qiu-Ping et al.'s [45] study, comparing two groups using Letrozole alone versus Letrozole combined with electroacupuncture and moxibustion with ginger, demonstrated significant improvements in endometrial thickness, morphology, and uterine artery blood flow in patients with PCOS when combining approaches. This combined approach led to enhanced endometrial receptivity, increased clinical pregnancy rates, and reduced early abortion rates. On the other hand, Wu et al.'s [46] study did not support these findings and concluded that the use of acupuncture, with or without clomiphene, did not increase live births compared to control acupuncture and placebo. This discrepancy may be attributed to the fixed acupuncture protocol utilized throughout the menstrual cycle, similar to the study by Dawood *et al.* [44]. These results emphasize the importance of customizing the acupuncture protocol and plant-based therapies according to the individual's menstrual cycle, as demonstrated in the studies by Duan *et al.* [41,]Qiu-Ping *et al.* [45] and Feng *et al.* [42], which exhibited evidence of the benefit of the TCM techniques over other approaches.

In summary, the research on phytotherapy and acupuncture revealed promising outcomes in improving pregnancy rates, but also highlighted the significance of individualized treatment approaches to optimize their efficacy. The combination of TCM methods with conventional medication appears to offer potential benefits in some cases, emphasizing the value of integrated treatment strategies for infertility patients.

As well, the study conducted by Ye *et al.* [48] demonstrated the effectiveness of moxibustion when combined with clomiphene citrate in achieving a higher pregnancy rate compared to using clomiphene alone ($p<0.05$). This finding suggests that moxibustion can complement and enhance the efficacy of conventional fertility medications, providing a potential benefit for women undergoing fertility treatments.

### *4.2. Other evaluations*

Furthermore, beyond increasing the pregnancy rate, the TCM techniques have shown effectiveness in improving various parameters that are important predictors of female fertility. These parameters include levels of FSH, LH, E2, AMH, progesterone, ovarian stromal resistance, antral follicular count, ovarian diameter, and endometrial thickness. By positively influencing these physiological markers, these TCM treatments may support better ovarian function, hormonal balance, and overall reproductive health in women with infertility issues.

Moreover, the TCM methods have been found to impact ovulation rates positively, which is crucial for achieving successful conception. Additionally, the reduction in the number of miscarriages and premenstrual symptoms observed in some studies further underscores the potential benefits of the TCM techniques in promoting a healthy pregnancy and improving reproductive outcomes.

Feng *et al.* [42,], Qiu-Ping *et al.* [45] and Ye *et al.* [48] investigated the combination of the TCM modalities with specific medications—phytotherapy with bromocriptine, acupuncture with letrozole, and moxibustion with clomiphene, respectively. In all three studies, the groups that received a combination of TCM and medication showed statistically higher pregnancy rates ($p<0.05$) compared to those using medication alone. These results suggest that integrating these TCM methods with conventional treatments may offer advantages in fertility enhancement.

Furthermore, Pan et al.'s [47] research comparing phytotherapy alone to its combined use with acupuncture revealed a statistically higher pregnancy rate in the group that received both therapies. This suggests that the synergistic effect of combining these two TCM modalities may be beneficial in enhancing fertility outcomes.

### *4.3. Intervention methodologies*

The acupuncture points used in the studies on infertility treatment showed a certain level of consistency, with some variations observed in Dawood et al.'s [44] study. The most

commonly used points, found in four out of five articles, were CV6 (*Qi Hai*) and CV4 (*Guan Yuan*).

*Guan Yuan* (CV4) is a crucial acupuncture point located at the crossing of the Spleen Meridian, Kidney Meridian, Liver Meridian, and Conception Vessel. It is considered the "root of human" and holds the *Yuan*-Primordial *Qi*. The stimulation of this point has the effects of invigorating and reinforcing the *Yuan*-Primordial *Qi*, consolidating the constitution, and benefiting the Kidneys [48].

*Qi Hai* (CV6), known as the "Sea of *Qi*," is another frequently used point in these studies. It tonifies *Qi*, *Yang*, and *Yuan Qi*, with a specific focus on strengthening the Kidneys, especially Kidney *Yang*. In addition, it regulates and promotes *Qi* circulation, warms and invigorates the Lower and Middle *Jiao*, and removes *Qi* stagnation and Dampness [61,62].

The use of these points is particularly relevant in infertility cases where a Kidney deficiency is associated with Liver stagnation/deficiency, blood stagnation, or Spleen deficiency.

Other commonly used points, appearing in three articles, include CV3 (*Zhong Ji*), LR3 (*Tai Chong*), SP6 (*San Yin Jiao*), SP10 (*Xue Hai*), ST29 (*Gui Lai*), and EX-CA1 (*Zi Gong*). Points used in two articles include GV20 (*Bai Hui*), CV12 (*Zhong Wan*), LI4 (*He Gu*), ST25 (*Tian Shu*), ST36 (*Zu San Li*), KI3 (*Tai Xi*), and PC6 (*Nei Guan*). As well, the systematic review and meta-analysis of Gao *et al.* [63] suggest that CV3, CV4, CV6, ST36, SP6 and Ex-CA1 appeared to be the most frequently selected traditional acupuncture points for women with anovulatory infertility.

In general, the selected acupuncture points align with the underlying syndrome diagnosed in infertility conditions. The points chosen help regulate *Qi*, nourish and activate blood movement, nourish Kidney *Yin*, calm the Liver, and strengthen the Spleen [61,62,64].

It is worth noting that Dawood et al.'s [44] study deviated from the pattern observed in other articles, as they used acupoints that were substantially different. This variation in acupoint selection may contribute to the inconclusive results regarding acupuncture's efficacy compared to other articles that utilized more consistent acupoints. The significance of proper acupoint selection, along with the consideration of individualized treatment based on the patient's specific condition, highlights the importance of adapting the acupuncture protocol according to the menstrual cycle, as mentioned before.

In the studies that employed phytotherapy as a TCM technique for treating infertility, various herbal formulas were utilized, and some common plants were frequently included in these formulas. These plants include *Rizhoma dioscoreae* (*Shan Yao*), *Semen cuscutae* (*Tu Si Zi*), *Radix Paeoniae alba* (*Bai shao Yao*), and *Fructus corni* (*Shan Zhu Yu*).

These plants and their combinations are selected based on the TCM diagnosis of the patient's condition, particularly for tonifing the Kidney and activating blood circulation, for Spleen-Kidney *Yang* deficiency conditions or Liver – Kidney deficiency.

In general, these plants tonify the Spleen and Liver, Nourish *Yin* and Blood, Tonify Kidney *Yin*, strengthen Kidney *Yang*, astringes *Jing*, calm Liver *Yang* and Stabilize body fluids [65].

Timing Adaptation of the intervention methodology

The findings from Qiu-Ping *et al.* [45] emphasize the importance of adapting TCM treatment based on syndrome differentiation and the different stages of the menstrual cycle. The menstrual period is characterized by drastic changes in *Qi* and blood, highlighting the need to activate blood circulation and remove stasis. The removal of stasis contributes to the generation of fresh blood, which is beneficial for embryo implantation.

During the follicular phase, the treatment focuses on strengthening the Spleen, replenishing the Kidneys, and nourishing the blood, specifically to support follicular development and maturation. In the ovulation phase, the emphasis is on replenishing the Kidneys, promoting collateral circulation, smoothing Liver *Qi*, removing stagnation, and activating blood circulation. This phase aims to create an optimal environment for ovulation and conception.

Moving on to the luteal phase, there is an increase in *Yang Qi* and a consumption of *Yin*. Therefore, the treatment at this stage should focus on regulating and replenishing Kidney *Yang*, strengthening the Spleen, and promoting blood circulation. The goal during this phase is to warm the uterus and create a favorable environment for the implantation of the fertilized egg [45].

This approach highlights the significance of understanding the different stages of the menstrual cycle and tailoring the TCM treatment accordingly.

By adapting the treatment based on the menstrual cycle, TCM practitioners can address the specific needs and imbalances of each stage, optimizing the chances of successful pregnancy and enhancing overall reproductive health. This individualized and holistic approach aligns with the fundamental principles of TCM, where the goal is to restore balance and harmony within the body for improved health and well-being. However, it remains doubtful if this adaptation could be an aspect that should be considered, and studies that show significant differences are needed. For example, in Ried's [66] updated meta-analysis, it was founded that switching to an ovulation-stimulating herbal formula (Wen-Jing-Tang) for 8 weeks in a subgroup of 60 Japanese women with PCOS resulted in a marked increase in their ovulation rate (59%) compared to a subgroup of women which did not switch the formula (7%) ($p = 0.0036$). Clinical studies [67,68] demonstrated that the formula had definite endocrinological effects on FSH, LH and estradiol favorable for ovulation.

### *4.4. Limitations*

This review has several limitations that should be considered when interpreting the results. Firstly, the number of studies included in our sample was relatively limited, which may affect the generalizability of the findings. Additionally, except for the study by Wu *et al.* [46], most of the individual studies had small sample sizes, potentially impacting the statistical power and precision of the results.

Another important limitation is the lack of double-blind studies, which can introduce bias and affect the reliability of the outcomes. However, some methodological flaws in TCM research are common and are related to the specific characteristics of the therapeutic techniques [69]. The short duration of the included studies and the limited follow-up time may also restrict our ability to assess the long-term effects of the TCM treatments on infertility.

Furthermore, some of the included studies lacked comprehensive information on treatment parameters, such as the exact timing of treatment initiation, the duration of treatment exposure, and the specific amounts of herbal formulas used. These details are crucial for understanding the treatment protocols and replicating the interventions in future research.

Moreover, an important aspect not addressed in most studies is the evaluation of male fertility, which could have a significant impact on the pregnancy rate results in both groups. The absence of male fertility assessment limits our understanding of the holistic effects of TCM treatments on infertility outcomes.

In summary, while this scoping review provides valuable insights into the effectiveness of acupuncture, moxibustion and phytotherapy for treating infertility, it is essential to acknowledge these limitations when interpreting the findings. Future studies should aim to address these shortcomings to strengthen the evidence base and provide more robust conclusions regarding the potential benefits of these TCM approaches in infertility management.

### *4.5. Final remarks*

In light of the data obtained from this scoping review, it is evident that acupuncture, phytotherapy, moxibustion, and electropuncture are common TCM methods used for the

treatment of infertility. The findings indicate that their efficacy is further enhanced when combined with certain medications or with each other.

Among the various acupoints and plants utilized in the studies, CV4 and CV6 were the most frequently employed acupoints. These points hold significance in addressing Kidney deficiency syndrome, which is commonly associated with infertility conditions. Additionally, the consistent use of *Rizhoma dioscoreae* (*Shan Yao*), *Semen cuscutae* (*Tu Si Zi*), *Radix Paeoniae alba* (*Bai shao Yao*), and *Fructus corni* (*Shan Zhu Yu*) in the phytotherapy formulations points to their importance in tonifying the Spleen and Liver, nourishing *Yin* and Blood, strengthening Kidney *Yang*, and stabilizing body fluids – all of which play critical roles in improving fertility.

It is essential to emphasize that the selection of acupoints and herbal formulas should be tailored to the specific syndrome diagnosis and menstrual cycle of each individual patient. This individualized approach is fundamental in maximizing the effectiveness of TCM treatments for infertility and ensuring a holistic and targeted management.

Overall, the findings of this review support the potential of acupuncture, moxibustion and phytotherapy as valuable therapeutic options for infertility treatment. However, it is vital to recognize that more research with larger sample sizes, longer study durations, and rigorous study designs is necessary to establish conclusive evidence regarding the benefits of these TCM techniques in infertility management. Moreover, future studies should strive to address the limitations identified in this review to strengthen the reliability and applicability of the findings.

## 5. Conclusion

The current evidence suggests that acupuncture, moxibustion and phytotherapy hold promise as effective interventions for infertility. Their combined use with medications or among different TCM modalities may offer additional advantages. Moving forward, a patient-centered approach, considering individual characteristics and specific syndromes, will be critical in optimizing treatment outcomes in the context of infertility management with TCM techniques.

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*Review*

# Research on the Effectiveness and Methodology of Acupuncture for Ankle Sprain – A Preliminary Systematic Review.

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**Abstract:** Background: Ankle sprains are a common musculoskeletal injury associated with significant pain, functional impairment, and high recurrence rates. Conventional treatments often combine pharmacological, physical, and rehabilitative strategies. Acupuncture, rooted in Traditional Chinese Medicine (TCM), is increasingly recognized for its potential therapeutic role, though its clinical effectiveness for ankle sprains requires further examination.
Objective: To make a preliminary systematic review of randomized controlled trials (RCTs) evaluating the efficacy of acupuncture in the treatment of ankle sprains, with a focus on methodological approaches and point selection.
Methods: A systematic search was conducted across PubMed, EuropePMC, and SciELO databases (inception–March 2025) using the keywords: (ankle sprain) AND (acupuncture) AND (randomized controlled trial). Inclusion criteria: RCTs involving human participants with ankle sprains, published in English, Chinese, Spanish, French, or Portuguese, evaluating acupuncture interventions. Data extraction focused on study design, interventions, comparators, outcomes, and acupuncture point selection.
Results: Eight studies comprising 604 participants met the inclusion criteria. Interventions included conventional acupuncture (6 studies), electro-acupuncture (1), and acupuncture with moxibustion (1). Acupuncture demonstrated consistent efficacy in reducing pain, improving function, and enhancing proprioception, often comparable to or exceeding standard therapies such as physiotherapy or pharmacotherapy. Commonly used points included ST41, GB40, and BL60. Localized techniques (e.g., surrounding needling), distal systemic points (e.g., LI4, LV3), and individualized *Ashi* points were employed depending on the injury stage and symptom presentation.
Conclusion: Acupuncture appears to be an effective and well-tolerated intervention for ankle sprains, showing promise in both acute care and rehabilitation. Strategic point selection and adjunctive methods may enhance outcomes. Despite encouraging findings, further high-quality RCTs are warranted to confirm efficacy.

**Keywords:** Acupuncture; Traditional Chinese Medicine; Ankle Sprain; Musculoskeletal Injury; Proprioception; Rehabilitation.

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## 1. Introduction

Sprains represent a substantial public health burden, characterized by their high incidence and the consequent decline in affected individuals' quality of life [1]. The clinical presentation of sprains, varying with severity and location, typically includes acute pain, localized inflammation, oedema, ecchymosis, restricted range of motion, and potential

joint misalignment. In severe cases, joint instability, heightened tenderness, and functional impairment may manifest [2-4]. Furthermore, complications arising from sprains and muscle injuries can lead to both transient and enduring disabilities, resulting in functional and socioeconomic limitations for affected individuals [1,4-6].

Musculoskeletal injuries, including sprains, are influenced by a variety of factors, encompassing age, inadequate warm-up routines, participation in contact sports, and genetic predispositions [7-9]. A comprehensive diagnostic process for sprains necessitates a thorough patient history, a detailed physical examination, and often, supplementary imaging. Radiography is invaluable for assessing joint structural integrity and identifying fractures, while ultrasound and magnetic resonance imaging (MRI) offers detailed visualization of soft tissue structures, such as muscles, tendons, and ligaments [10-14].

Specifically, acute ankle sprains represent a prevalent musculoskeletal injury, particularly among individuals engaged in physical activities [15,16]. Furthermore, these sprains exhibit a high recurrence rate, contributing to the development of chronic ankle instability [16,17]. Preventive interventions centred on musculoskeletal strengthening, balance, proprioceptive training, and biomechanical optimization have demonstrated significant benefits in mitigating lower extremity musculoskeletal injuries and facilitating recovery from pain and dysfunction in targeted populations [18,19].

Conventional treatment strategies for sprains typically involve a multidisciplinary approach, prioritizing pain alleviation, inflammation reduction, tissue healing promotion, and functional restoration. This may include pharmacological management with analgesics and anti-inflammatory agents, physiotherapy for muscle strengthening, flexibility enhancement, and functional rehabilitation, temporary joint immobilization using splints or bandages, and, in severe cases, surgical interventions to repair damaged anatomical structures [20-22]. However, it is crucial to acknowledge that the scope of research evaluating the efficacy of certain interventions remains limited, despite promising preliminary findings [23]. Given the high incidence of recurrent ankle sprains, chronic ankle instability, and their association with posttraumatic osteoarthritis, the development and evaluation of secondary and tertiary prevention strategies are imperative to decrease the prevalence of these conditions [23].

Traditional Chinese medicine (TCM), a system of healthcare refined over millennia [24-28], posits that health is contingent upon the harmonious balance of the body's interconnected systems. Disruptions in this equilibrium can manifest as illness [28-32]. The integration of TCM therapies into conventional Western medicine practices reflects a growing trend towards integrative medicine, recognizing the potential synergistic benefits of both approaches [33-42].

Acupuncture, a TCM technique involving the insertion of fine needles into specific anatomical points [37,43,44], has gained recognition as a valuable therapeutic modality for various health conditions [45-48]. Its mechanism of action is thought to involve the modulation of the nervous, endocrine, exocrine, and circulatory systems, fostering optimal health [49]. In the context of musculoskeletal injuries, acupuncture may contribute to pain reduction, inflammation mitigation, enhanced local blood flow, muscle spasm relief, and tissue regeneration [50,51].

Therefore, the goal of this study is to conduct a comprehensive review of the available evidence on the use of acupuncture for ankle sprains, with a focus on its effectiveness and methodology.

## 2. Methodology

### *2.1. Search Strategy*

A literature search was performed to identify randomized controlled trials (RCTs) assessing the efficacy of acupuncture in the treatment of ankle sprains. A comprehensive search strategy was developed and implemented across multiple electronic databases, including PubMed, EuropePMC, and SciELO, covering the period from database inception

to March 2025. The search strategy utilized the following Boolean operators: (Ankle sprain) AND (acupuncture) AND (randomized controlled trial).

### *2.1. Eligibility Criteria*

This review included RCTs investigating the effect of acupuncture on ankle sprains in human participants. Studies were eligible for inclusion if they: (1) involved participants with a diagnosis of ankle sprain; (2) were published in English, Chinese, Spanish, French, or Portuguese; (3) evaluated any form of acupuncture as an intervention; and (4) reported ankle sprain-related outcomes. Studies involving animal subjects or those lacking an acupuncture intervention were excluded.

## 3. Results

A total of 34 records were identified through database searches. After removing 11 duplicates, 23 records remained for screening. Of these, 13 were excluded.

Ten full-text reports were sought for retrieval, with one report not retrieved. Among the nine reports assessed for eligibility, one was excluded for using the wrong study design. Ultimately, eight studies met the inclusion criteria and were included in the systematic review.

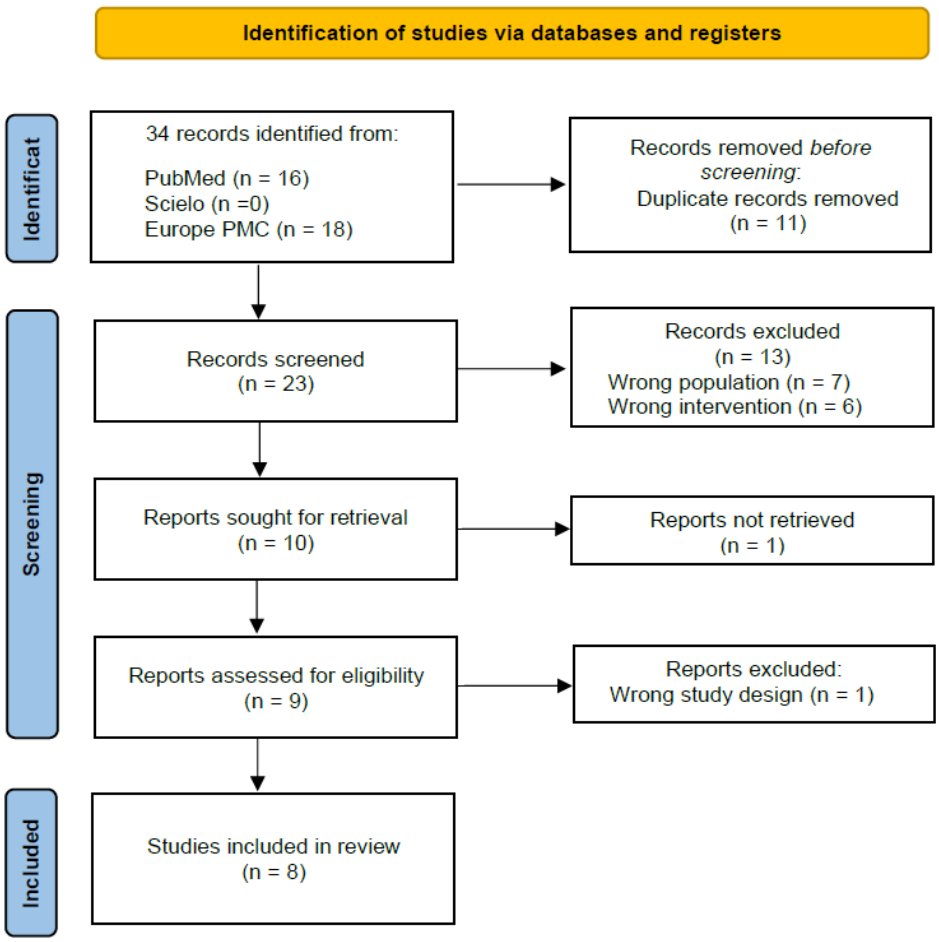


Figure 1 provides detailed information about the selection process

Eight studies involving 604 participants were included. All studies evaluated various acupuncture-based interventions for ankle sprain or related conditions, with sample sizes ranging from 30 to 166 participants.

Conventional acupuncture was the most frequently applied technique, used in 6 studies [52-57]. Electro-acupuncture and conventional acupuncture with moxibustion were each used in 1 study [58,59].

Several techniques were used as comparators, namely physiotherapy [58,59], micro-needle knife therapy [52], kinesiotape [53], tendon regulation manipulation [54], cold compression [55], pharmacotherapy [56], and tuina [57].

A summary of the characteristics of the included studies is provided in Table 1.

Table 1. Characteristics of the included studies.

| Study | Acupuncture technique | Sample | Comparators |
|---|---|---|---|
| Lu *et al.* [52] | Conventional acupuncture | 80 patients | Micro-needle knife therapy |
| Shin *et al.* [53] | Conventional acupuncture | 60 patients | Kinesiotape + acupuncture |
| Du *et al.* [54] | Conventional acupuncture | 60 patients | Tendon regulation manipulation or tendon regulation manipulation + *Xiaojie* |
| Zhang *et al.* [55] | Conventional acupuncture | 68 patients | Cold compression |
| Cohen *et al.* [56] | Conventional acupuncture | 528 patients (166 with ankle sprain) | Pharmacotherapy or Pharmacotherapy + acupuncture |
| Yang *et al.* [57] | Conventional acupuncture | 90 chronic sprain patients | Tuina |
| Tang *et al.* [58] | Conventional acupuncture with moxibustion | 30 athletes | Physiotherapy |
| Zhu *et al.* [59] | Electro-acupuncture | 50 athletes | Physiotherapy |

## 4. Effectiveness of acupuncture for ankle sprain

The findings from the reviewed studies underscore the clinical effectiveness of acupuncture and related interventions in the treatment of ankle sprains, with consistent evidence supporting their role in reducing pain, improving joint function, and enhancing proprioception. However, differences in treatment modalities, outcome measures, and follow-up periods warrant a nuanced interpretation of the results.

Lu *et al.* [52] demonstrated that both acupuncture and micro-needle knife therapy significantly improved pain and function without adverse events. Notably, micro-needle knife therapy exhibited superior short-term efficacy in releasing superficial fascia at the intermediate time point, although this advantage was not sustained by the final assessment. This suggests a potentially faster onset of action with micro-needle therapy, while long-term outcomes may converge across modalities. Although both TCM techniques were comparable in efficacy, acupuncture emerges as a less invasive approach that does not require any kind of anaesthetic before intervention.

In the randomized study by Shin *et al.* [53], both acupuncture and the combination of acupuncture with kinesiotaping led to significant improvements in pain, function, and quality of life. However, no statistically significant differences were observed between groups, including in subgroup analyses based on symptom severity. These findings highlight the comparable efficacy of acupuncture-based therapies and suggest that adjunct techniques may not offer additional benefits in all cases.

Du *et al.* [54] compared the use of *Xiaojie* point manipulation, tendon-regulation therapy and both techniques combined. The authors reported high effectiveness across all treatment groups, with a notably higher curative rate in the combined therapy group. Reductions in pain and symptom scores were more pronounced in the combined and *Xiaojie* point manipulation groups compared to tendon-regulation therapy. These findings support the additive effects of integrative treatment strategies, particularly in alleviating pain and swelling.

Similarly, Zhang *et al.* [55] compared the use of the combination of surrounding acupuncture needling and cold compression to cold compression alone. It was found that while both groups experienced significant improvements in pain and ankle function, the combined therapy group achieved superior outcomes. The observed benefits at both early (3-day) and later (1-week) time points underscore the potential value of multimodal interventions during the acute phase of recovery.

In the study of Cohen *et al.* [56], significant functional improvements were observed in all groups, including acupuncture, pharmacotherapy, and their combination, with no significant differences between them. These results suggest that acupuncture may be as effective as conventional pharmacological treatment in the early management of ankle sprains, offering a potentially valuable non-pharmacologic alternative.

Yang *et al.* [57] further emphasized the efficacy of individualized or combination-enhanced interventions. The combination group was exposed to an acupuncture plus tuina massage intervention while the control group received tuina massage only. The combination of both techniques demonstrated superior outcomes in pain reduction during running, lower pain at rest, and higher patient satisfaction. These findings add strength to the idea that tailoring treatment components may enhance therapeutic outcomes.

Proprioceptive recovery, a critical component in ankle sprain rehabilitation, was addressed by Tang *et al.* [58] and Zhu *et al.* [59]. Both studies reported significant improvements in joint position sense following acupuncture and electroacupuncture respectively, with outcomes superior to those observed in physiotherapy groups. These findings indicate a potential advantage of acupuncture over physiotherapy in restoring neuromuscular control and preventing recurrent injury.

Although systematic reviews [60,61] previously lacked sufficient high-quality evidence to endorse acupuncture, more recent systematic reviews [62,63] support its potential therapeutic benefit for patients with acute ankle sprain, which is in agreement with the results of the present research.

## 5. Analysis of Acupuncture Point Selection Across Studies

The reviewed studies employed a range of acupuncture points for the treatment of ankle sprains, primarily combining local points near the injury site with distal or systemic points aimed at broader physiological effects such as pain modulation and circulation enhancement. Most techniques used conventional acupuncture, with only one study applying electroacupuncture and another incorporating moxibustion.

According to the data provided in Table 2., several acupuncture points emerged as commonly selected for ankle sprain, particularly ST41 (*Jiexi*) which was used in 6 studies, GB40 (*Qiuxu*) and BL60 (*Kunlun*) which were used in 5 studies.

Table 2. Acupuncture points used in the included studies.

| Study | Acupuncture points |
|---|---|
| Lu *et al.* [52] | Points: GB39, BL60, BL40, ST41, KI9, and KI6. |
| Shin *et al.* [53] | Points: ST36, ST41, BL60, BL62, KI3, KI6, GB39, and GB40 |
| Du *et al.* [54] | Points: Xiaojie |
| Zhang *et al.* [55] | Points: Surrounding needling |
| Cohen *et al.* [56] | Points: LI4 and LV3<br>Local points would be selected from:<br>ST41, GB40, BL60, BL62, BL63; or BL64 KI2, KI3, KI6, SP4, SP5.<br>Distal points: SP6, SP9, GB34, ST36, and HT7 on the opposite wrist.<br>Other points: *Ashi* points as suitable. |
| Yang *et al.* [57] | Points: BL62/KI6, ST41/LR4, and GB40/SP5.<br>Other points: 2 *Ashi* points as suitable. |
| Tang *et al.* [58] | Points: GB40, BL60, BL62, and ST41. |

| | |
|---|---|
| | Other points: *Ashi* points around the injury site. |
| Zhu *et al.* [59] | Points: ST41, BL60 and GB40.<br>Other points: *Ashi* points as suitable. |

BL62 (*Shenmai*) and KI6 (*Zhaohai*) were also frequently used (4 studies), while GB39 (*Xuanzhong*) was used less often (2 studies).

All these points are anatomically relevant to the ankle region as they are located near the lateral malleolus and Achilles tendon, frequently involved in ankle sprain injuries [64]. Their frequent selection suggests a consensus around their local effectiveness for reducing inflammation, relieving pain, and supporting tissue healing.

Also important to note, several studies [56-59] employed *Ashi* points, or points of tenderness/pain identified through palpation. This approach allows for individualized treatment based on specific patient pathology and aligns with TCM principles [65]. *Ashi* points are particularly useful in musculoskeletal injuries due to their capacity to localize qi and blood stasis [66-68].

However, some studies included the use of distal and systemic points. For example, LI4 (*Hegu*) and LV3 (*Taichong*), called the "four gates" are traditionally used for systemic circulation and pain relief and neuroimaging studies of this combination are being conducted [69-72] Other examples are SP6, SP9, ST36, and GB34, which are being studied for their regulatory distal effects [73-81]. This broader approach may reflect an attempt to balance local treatment with systemic support, especially useful in more chronic or severe cases.

Some other examples may be the use of HT7 (*Shenmen*) in the contralateral wrist of the affected ankle. This is a classic approach already mentioned in the ancient classic of the Yellow Emperor [82] which states that this technique is one of the nine "needling techniques to treat the nine types of pathological conditions(…) the eighth technique is the counterpart puncture, for the disease of the left, pricking the acupuncture point of the right, and vice versa" [83]. Indeed, functional magnetic resonance imaging studies demonstrate that contralateral acupuncture elicits specific brain activation and connectivity patterns [84-86], potentially explaining its therapeutic benefits.

Meanwhile, specific approaches were also employed in some studies. Zhang *et al.* [55] used surrounding needling (also called "Surrounding the Dragon" or *Wei Ci*), a local technique targeting the injury perimeter, emphasizing direct modulation of inflammation and soft tissue healing [87-89]. On the other hand, Du *et al.* [54] focused on the Xiaojie point, less commonly reported in mainstream acupuncture literature. This point is located in the LU channel between LU10 and LU11, at the junction of the 1st metacarpal bone and the distal phalangeal segment of the thumb, and is specifically indicated for ankle sprain [90,91].

Also, electroacupuncture Zhu *et al.* [59] and moxibustion Tang *et al.* [58] were used adjunctively to stimulate points more intensely or provide warmth, respectively, which may enhance blood flow and neuromuscular recovery [92-94].

Regarding the injury stage, there appears to be a trend toward more local point use in acute settings (e.g., Lu *et al.* [52], Zhang *et al.* [55]), while distal points and systemic strategies (e.g., Cohen *et al.* [56]) were more common in larger or more generalized samples. Studies focusing on chronic conditions or athletes (e.g., Yang *et al.* [57], Tang *et al.* [58], Zhu *et al.* [59]) emphasized proprioceptive recovery and joint function, influencing point selection accordingly.

## 6. Implications for clinical practice and future research

The findings from the reviewed studies affirm the clinical utility of acupuncture in the management of ankle sprains. There is consistent evidence supporting their efficacy in alleviating pain, improving joint function, and enhancing proprioception. These therapeutic benefits position acupuncture techniques as valuable tools in both acute and rehabilitative care.

The frequent selection of acupuncture points such as GB40, BL60, and ST41 highlights their potential role as foundational elements in treatment protocols for ankle sprains. This

trend may reflect a shared clinical consensus regarding their efficacy in addressing joint mobility, pain, and local circulation. Furthermore, the integration of *Ashi* points underscores a semi-standardized yet personalized treatment framework, allowing practitioners to tailor interventions based on individual patient presentations while maintaining consistency in therapeutic strategy.

Moreover, the application of adjunct techniques signals a growing interest in enhancing clinical outcomes through multimodal interventions. These combinations appear to support improved functional recovery, suggesting avenues for further exploration.

## 7. Conclusions

This review highlights the growing body of evidence supporting the use of acupuncture as an effective treatment modality for ankle sprains. Across diverse clinical settings, acupuncture consistently demonstrated benefits in pain relief, functional recovery, and proprioceptive enhancement. The strategic selection of local, distal, and *Ashi* points reflects both traditional principles and evolving clinical consensus. Integrating acupuncture into conventional musculoskeletal care may offer a valuable, individualized approach to both acute and chronic ankle sprain management. However, more high-quality studies are needed to support these findings.

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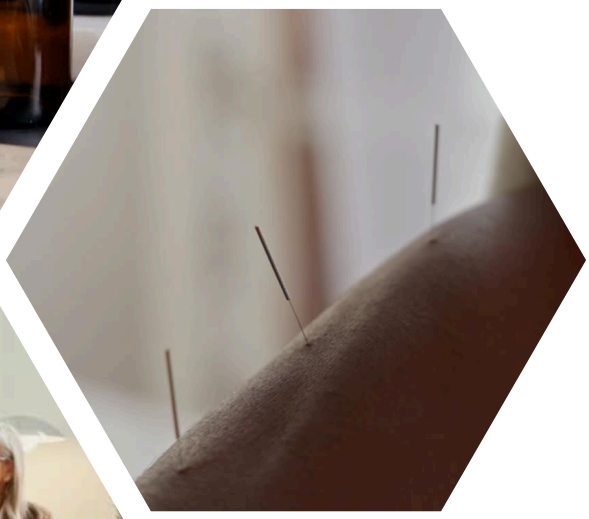

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