Review Article

Chiropractic: Is it Efficient in Treatment of Diseases? Review of Systematic Reviews

Alireza Salehi¹, MD, MPH, PhD; Neda Hashemi¹, MSc; Mohammad Hadi Imanieh¹, MD; Mahboobeh Saber², MD

¹Research Center for Traditional Medicine and History of Medicine, Shiraz University of Medical Sciences, Shiraz, Iran;
²Department of Medical Ethics, Shiraz Medical School, Shiraz University of Medical Sciences, Shiraz, Iran

Corresponding author:
Alireza Salehi, MD, MPH, PhD; Research Center for Traditional Medicine and History of Medicine, Shiraz Medical School, Setad Square, Zand Street, Shiraz, Iran
Tel: +98 71 32337589; Fax: +98 71 32338476; Email: salehialireza45@yahoo.com

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Abstract
Chiropractic is a complementary medicine that has been growing increasingly in different countries over recent decades. It addresses the prevention, diagnosis and treatment of the neuromusculoskeletal system disorders and their effects on the whole body health. This study aims to evaluate the effectiveness of chiropractic in the treatment of different diseases. To gather data, scientific electronic databases, such as Cochrane, Medline, Google Scholar, and Scirus were searched and all systematic reviews in the field of chiropractic were obtained. Reviews were included if they were specifically concerned with the effectiveness of chiropractic treatment, included evidence from at least one clinical trial, included randomized studies and focused on a specific disease. The research data including the article’s first author’s name, type of disease, intervention type, number and types of research used, meta-analysis, number of participants, and overall results of the study, were extracted, studied and analyzed. Totally, 23 chiropractic systematic reviews were found, and 11 articles met the defined criteria. The results showed the influence of chiropractic on improvement of neck pain, shoulder and neck trigger points, and sport injuries. In the cases of asthma, infant colic, autism spectrum disorder, gastrointestinal problems, fibromyalgia, back pain and carpal tunnel syndrome, there was no conclusive scientific evidence. There is heterogeneity in some of the studies and also limited number of clinical trials in the assessed systematic reviews. Thus, conducting comprehensive studies based on more reliable study designs are highly recommended.

Keywords: Alternative medicine, Chiropractic, Complementary medicine, Systematic review

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INTRODUCTION

Chiropractic is a type of complementary medicine with various definitions in different articles and other scientific resources. According to the World Health Organization’s (WHO) definition, chiropractic is “a health care profession concerned with the diagnosis, treatment and prevention of disorders of the neuromusculoskeletal system, and the effects of these disorders on general health”. Chiropractic treatment procedures emphasize the manual techniques, including joint adjustment and/or manipulation, with a specific focus on subluxation.1

The basis of chiropractic approach to restoration and protection of health is the relationship between structure, specifically the spine and musculoskeletal system, and function, particularly as coordinated by the nervous system. In other words, based on the chiropractic approach, the body is regarded as a neuromusculoskeletal system in which disorder in one part of the system disturbs the other parts. Therefore, disorders in the body structure are removed so that stresses on the body’s nervous system can be alleviated and the general health of the body can be restored.1-5

Chiropractic was founded by Daniel David Palmer in the United States of America (USA), in 1895, and it gradually attracted its proponents among doctors and other healers. Nowadays, chiropractic is taught in at least 40 universities and colleges, in 16 different countries (Table 1). Moreover, most of these are located in the USA as it is the birth place of chiropractic (Figure 1). Chiropractic is practiced worldwide and is regulated by law in 40 countries such as the USA, Australia, Germany, France, Brazil, Japan, England, and Denmark.1,6-8 Moreover, at least 17 journals with the exact name ‘chiropractic’ publish chiropractic related articles worldwide9-13 (Table 2).

Table 1: Chiropractic Universities and Colleges

| Continent | Country | Chiropractic Institution | Web site |
|-----------|---------|--------------------------|----------|
| Oceania   | Australia | Macquarie University, Department of Chiropractic | Website Address: http://www.chiro.mq.edu.au/ |
|           |         | Murdoch University, School of Chiropractic and Sports Science | Website Address: http://www.murdoch.edu.au/School-of-Chiropractic-and-Sports-Science/ |
|           |         | Royal Melbourne Institute of Technology (RMIT) University, Discipline of Chiropractic | Website Address: http://www.rmit.edu.au/chiropractic |
| New Zealand |         | New Zealand College of Chiropractic | Website Address: http://www.chiropractic.ac.nz/chiropractic-education/index.php |
| South America | Brazil | Anhembi Morumbi University | Website Address (in Portuguese): http://portal.anhembi.br/index.html |
|           |         | Feevale Central University | Website Address (in Portuguese): http://www.feevale.br/home/ |
|           |         | Canadian Memorial Chiropractic College | Website Address: http://www.cmcc.ca/ |
| Asia      | Japan   | Murdoch University International Study Centre Japan | Website Address (in Japanese): http://chiropractic-edu.jp/ |
|           |         | Tokyo College of Chiropractic | Website Address: http://www.chiro.jp/english |
|           |         | Royal Melbourne Institute of Technology (RMIT) University Chiropractic Unit Japan | Website Address: http://www.chiro.co.jp/english.html |
| Malaysia  |         | International Medical University | Division of Traditional and Complementary Medicine (IMU) |
|           |         | | Website Address: http://www.imu.edu.my/pro-un-chiro.html |
| South Korea |         | Hanseo University | Graduate School of Health Promotion (Hanseo University) |
| Africa    | South Africa | Durban University of Technology, Department of Chiropractic and Somatology | Website Address: http://www.dut.ac.za/pages/22613 |
|           |         | University of Johannesburg, Department of Chiropractic | Website Address: http://www.uj.ac.za/EN/Faculties/health/departments/chiropractic/Pages/default.aspx |
Table 1: Chiropractic Universities and Colleges

| Continent    | Country        | Chiropractic Institution                                         | Web site                                                                 |
|--------------|----------------|-------------------------------------------------------------------|---------------------------------------------------------------------------|
| Europe       | Denmark        | University of Southern Denmark, Institute of Sports Science and Clinical Biomechanics | Website Address: http://www.sdu.dk/Uddannelse/bachelor/klinisk_bioteknik  |
|              |                | Institut Franco-Européen de Chiropratique                         | Website Address (in French): http://www.ifec.net/                         |
|              | Spain          | Real Centro Universitario Escorial Maria Christina               | Website Address: (Spanish): http://www.reumariacristina.com/              |
|              |                | Barcelona College of Chiropractic                                 | Website Address: http://www.bcciropractic.es/                            |
|              | Sweden         | Skandinaviska Kiropraktorhögskolan (Scandinavian College of Chiropractic) | Website Address (Swedish): http://www.kiropraktik.edu/                   |
|              | Switzerland    | Universität Zürich (University of Zurich)                        | Website Address (English): http://www.uzh.ch/index_en.html               |
|              | United Kingdom | Anglo-European College of Chiropractic                            | Website Address (English): http://www.aecce.ac.uk/                       |
|              |                | McTimoney College of Chiropractic                                 | Website Address: http://www.mctimoney-college.ac.uk/                    |
| North America| Mexico         | Universidad Estatal del Valle de Ecatepec                         | Website Address (Spanish): http://www.uneve.edu.mx/                      |
|              | Canada         | Université du Québec à Trois-Rivières, Département de Chiropratique | Website Address (in French): http://www.uqtr.ca/Departement/chiro.shtml  |
|              | United States  | Cleveland Chiropractic College                                    | Website Address: http://www.cleveland.edu/                              |
|              |                | D’Youville College, integrative holistic health studies department | Website Address: http://www.dyc.edu/academics/chiropractic/index.asp      |
|              |                | Life University, College of Chiropractic                         | Website Address: http://www.life.edu/Chiropractic_College               |
|              |                | Life Chiropractic College West                                    | Website Address: http://www.lifewest.edu/                               |
|              |                | Logan College of Chiropractic                                     | Website Address: http://www.logan.edu/                                  |
|              |                | National University of Health Sciences                             | Website Address: http://www.nuhs.edu/                                   |
|              |                | New York Chiropractic College                                     | Website Address: http://www.nycc.edu/                                   |
|              |                | Northwestern Health Sciences University, Northwestern College of Chiropractic | Website Address: http://www.nwhealth.edu/                             |
|              |                | Palmer College of Chiropractic, Davenport Campus                  | Website Address: http://www.palmer.edu/                                 |
|              |                | Palmer College of Chiropractic, West Campus                       | Website Address: http://www.palmer.edu/                                 |
|              |                | Palmer College of Chiropractic, Florida Campus                    | Website Address: http://www.palmer.edu/                                 |
|              |                | Parker University                                                 | Website Address: http://www.parker.edu/Welcome_to_Parker_University.aspx |
|              |                | Sherman College of Chiropractic                                   | Website Address: http://www.sherman.edu/default.aspx                    |
|              |                | Southern California University of Health Sciences, Los Angeles College of Chiropractic | Website Address: http://www.scuhs.edu/academics/lacc/                  |
|              |                | Texas Chiropractic College                                        | Website Address: http://www.txchiro.edu/                               |
|              |                | University of Bridgeport, College of Chiropractic                 | Website Address: http://www.bridgeport.edu/academics/graduate/chiro     |
|              |                | University of Western States                                      | Website Address: http://www.uws.edu/default.aspx                        |
Applying manual techniques in musculoskeletal disorders has a long history in Iran. Avicenna and other traditional Iranian healers noted its healing properties in their books and essays. For instance, *ghamz* a term used in traditional Iranian medicine is...
equal to reflex therapy, one of the methods applied in chiropractic. However, in Iran, chiropractic history using the modern definition dates back to 20 years when a group of Iranian specialists graduated from foreign universities and established the Iranian Doctors of Chiropractic Association (IDCA), as a member of the Universal Chiropractors’ Association (UCA). The chiropractic major was approved by the Iranian Ministry of Health and Medical Education (MoHME) in 1992, and the Iranian Chiropractic Association (IrCA) was founded by the license of the MoHME in 2004.

The increasing distribution of chiropractic worldwide, including Iran, demonstrates the importance and necessity of assessment into its effectiveness on the management of diseases. The purpose of this study was to evaluate the effectiveness of chiropractic in treating different diseases, based on the results of systematic reviews.

**MATERIALS AND METHODS**

In this study, the search strategy focused on systematic reviews in the field of chiropractic treatment in improving and removing any disease. The searching period was between July and November 2014. We applied a systematic approach to reviewing the chiropractic systematic reviews by following a sequence of online searching strategies as follows:

- Searching in the Cochrane Database of Systematic Reviews for systematic reviews and meta-analyses for chiropractic treatment.
- Direct searching in the following English databases: Medline, AMED (Allied and Complementary Medicine), Google Scholar, and Scirus.
- Direct searching in the following Persian databases: Iranmedex, Irandoc, and Scientific Information Databases (SID).

The keywords applied in our search strategy included the following terms: chiropractic systematic reviews, chiropractic meta-analysis, and relevant literature published in the English language. No time restriction was applied. After the primary search, several secondary searches were performed based on “related links” and also additional publications by the authors identified in the primary search. Lastly, citation reviews were done manually to recognize any other appropriate studies. The full text versions of identified studies were obtained and studied. The articles were excluded if:

- they were concerned with a combination of chiropractic and other treatments (not specifically chiropractic treatment);
- they lacked at least one clinical trial;
- they lacked at least one randomized study;
- and they studied chiropractic in the treatment of multiple diseases.

The included articles were studied intensively and research data including article’s first author’s name, condition treated, chiropractic intervention type, number and type of researches studied, meta-analysis, number of participants, and overall results were extracted and analyzed (Figure 2).

**RESULTS**

There were 23 chiropractic systematic reviews found, and the 11 articles that met the defined criteria were included. The conditions included back pain, neck pain, upper extremity conditions, infant colic, autism spectrum disorder, asthma, gastrointestinal conditions, fibromyalgia, sport injuries and carpal tunnel syndrome. Among the studied articles, only one had a meta-analysis (Table 3).

**DISCUSSION**

According to the results of the systematic reviews, the effectiveness of chiropractic in treatment of each disease is as follows:

**Asthma**

Chiropractic effectiveness in treatment of patients with asthma was determined in a systematic review carried out by Kaminsky. The methodological quality of the articles was assessed using a 27-item scoring checklist.
developed by Downs and Black. According to the results of the study, chiropractic had a positive role in improving some subjective measures of treatment effectiveness, like reported number of asthma attacks, use of medication, quality of life and patient-reported changes in asthma symptoms and to a lesser degree improving some objective measures including peak expiratory flow, vital capacity and forced expiratory volume. However, since most of the reported changes in statistical analysis were not significant and also due to heterogeneity of the study designs assessed in this systematic review, there was not sufficient and suitable evidence at this time to show that chiropractic is effective in treatment of asthma.21

**Infant Colic**

According to the two systematic reviews evaluating chiropractic effectiveness in treatment of infant colic, three randomized control clinical trials were examined. Two of these were single blinded. In all of the three
Table 3: Systematic reviews of chiropractic

| No | Condition treated | First author | Interventions | Type of Designs | Meta-analysis | Participants | Results |
|----|--------------------|--------------|---------------|----------------|--------------|--------------|---------|
| 1  | Asthma             | Kaminskyj (2010) | Spinal manipulation, mobilization, soft tissue therapy, respiratory exercises | 1 case series, 1 case study, 2 randomized controlled clinical trials, 1 randomized patient and observer blinded crossover trial, 1 single blind cross-study design, 1 survey study | No | 190 | Patients experience positive subjective and at times positive objective results while under chiropractic treatment; however, the existent evidence is inadequate and heterogeneous in its quality strength. |
| 2  | Infant colic       | Ernst (2009)   | Spinal manipulation | 3 randomized controlled clinical trials | Yes | 198 | Although according to the evidence chiropractic spinal manipulation is not an effective treatment for infant colic, numerous weaknesses of the primary data would prevent firm conclusions. |
| 3  | Infant colic       | Alcantara (2011) | Spinal manipulation treatment and chiropractic adjustment treatments | 3 randomized controlled clinical trials, 2 survey studies, 6 case reports, 2 case series, 4 cohort studies, 5 commentaries, 4 reviews of the literature | No | 170 | The findings support chiropractic as an alternative approach to infantile colic, despite the infancy of researches on pediatric chiropractic and also the results of the previous reviews contradiction with the results of this study. |
| 4  | Sport injuries     | Ernst (2011)   | All chiropractic interventions provided by chiropractors | 4 randomized controlled clinical trials and 2 controlled clinical trials | No | 208 | Although the previous clinical trials almost support the effectiveness of chiropractic in the prevention and treatment of the sport injuries, it is far from conclusive and the future studies of chiropractic should adhere more to accepted standards of trial design and reporting. |
| 5  | Neck pain          | Ernst (2003)   | Spinal manipulation treatment | 4 randomized controlled clinical trials | No | 419 | The superiority of chiropractic treatment to conventional exercise treatment and other physiotherapy procedures in the neck pain therapy is not supported by rigorous trial data. |
| 6  | Upper extremity conditions | McHardy (2008) | Different chiropractic interventions | 6 clinical trials (3 shoulder, 1 elbow, 2 wrist), 36 case reports for shoulder, 8 case reports for the elbow, 14 case reports for the wrist/hand | No | 252 | There are strong low-level researches to support the chiropractic care of a large number of upper extremity conditions, and this care should be regarded in the decisions of disease management, especially before invasive measures are done. |
| 7  | Autism spectrum disorder | Alcantara (2011) | Spinal manipulation treatment and chiropractic adjustment treatments | 1 randomized controlled clinical trials, 1 cohort study, 3 case reports | No | 14 | Due to lack of enough supportive evidence, further research for definitive studies on chiropractic effectiveness for autism spectrum disorder is recommended. Nonetheless, given the lack of effectiveness of pharmaceutical agents, a trial of chiropractic care for autism patients is prudent and warranted. |
studies, chiropractic was more effective in the intervention group than the control group, but in only one of these studies there were statistically significant differences. In conclusion, although evidence regarding chiropractic effectiveness in the treatment of infant colic is insufficient at this point in time, regarding the positive results of some of the clinical trials, it is recommended that more comprehensive studies should be designed and performed.22,23

Sport Injuries
The systematic review evaluating chiropractic effectiveness in prevention and treatment of sport injuries showed that chiropractic is significantly more effective than conventional treatments in prevention of lower limb muscle strain, hallux abducto valgus (bunion), and lateral epicondyritis (tennis elbow). Therefore, current studies provide some evidence regarding chiropractic effectiveness on the prevention and treatment of sport injuries to a certain extent. However, conducting more comprehensive research on the previously mentioned cases and other sport injuries is essential.24

Neck pain
In a systematic review conducted by Ernst et al., clinical trials regarding the effectiveness of chiropractic treatment were assessed. The comparison between the effectiveness of different methods as chiropractic treatment, exercise therapy, and other physiotherapy treatments indicated that all the three groups were improved and there was no significant difference found between the groups. Thus, the effectiveness of chiropractic was equivalent to these conventional treatments in the management of neck pain.25

Upper Extremity
McHardy et al. assessed six clinical trials and a number of case studies in their systematic review. In the clinical trials, chiropractic effectiveness, in the treatment of shoulder and neck trigger points and also carpal tunnel syndrome, was compared with conventional therapies especially physiotherapy and rehabilitation, and no significant differences were observed. Therefore, the effectiveness of chiropractic was found to be as effective as conventional therapies. The comparison of chiropractic with physical therapy in

| Table 3: Systematic reviews of chiropractic |
|-------------------------------------------|
| No | Condition treated | First author (year) | Interventions | Type of Designs | Meta-analysis | Participants | Results |
|----|--------------------|---------------------|---------------|-----------------|---------------|--------------|---------|
| 8  | Gastrointestinal problems28 | Ernst (2011) | All chiropractic interventions | 1 randomized controlled clinical trials, 1 pilot study clinical trial | No | 86 | Chiropractic is not effective in the treatment of gastrointestinal Conditions. |
| 9  | Fibromyalgia29 | Ernst (2009) | All chiropractic interventions | 4 randomized controlled clinical trials | No | 129 | Without conclusive evidence, it is impossible to confirm or reject the claim that chiropractic is effective in treatment of fibromyalgia. Hence, more well-developed researches are clearly needed. |
| 10 | Back pain30 | Ernst (2003) | Spinal manipulation treatment | 12 randomized controlled clinical trials | No | 1960 | Despite some degree of superiority of chiropractic spinal manipulation over control interventions including sham chiropractic, its effectiveness is not supported by compelling evidence from the majority of randomized clinical trials. |
| 11 | Carpal tunnel syndrome31 | Hunt (2009) | All chiropractic interventions | 1 randomized controlled clinical trials | - | 91 | There is insufficient evidence to suggest that future treatment of carpal tunnel syndrome should deviate from conventional treatment of carpal tunnel syndrome. |
treatment of lateral epicondylitis indicated a significant superiority of physical therapy (continuous ultrasound).  

Autism Spectrum Disorder

The use of different types of complementary medicine, especially chiropractic, in treatment of autism spectrum disorder, is prevalent due to a lack of effective pharmaceutical treatment. In a systematic review conducted by Alcantara et al., on the chiropractic effectiveness of reducing deficits in social interactions, the impairment of verbal and non-verbal relationships, and the problems of autism spectrum disorder patients were assessed. Although the evaluation of one cohort study, one clinical trial, and three case studies showed the relative effectiveness of chiropractic, the absence of a comparative group and some other issues in the research methodology led to inadequate evidence in confirming chiropractic effectiveness in the treatment of autism spectrum disorder.  

Gastrointestinal Problems

In a systematic review conducted by Ernst et al., chiropractic effectiveness in the treatment of gastroesophageal reflux and duodenal ulcer was examined by assessing two clinical trials. In one clinical trial, spinal manipulation was compared with ischemic compression in the treatment of gastroesophageal reflux and no significant difference was observed. In another study, spinal manipulation accompanied by conventional treatment was compared with mere conventional treatment and again no significant relationship was seen. Nevertheless, the results of these clinical trials are not reliable due to serious methodological defects, including a lack of comparison with conventional therapies in the first study, and no randomization in the second one. Therefore, there is no scientific evidence regarding the effectiveness of chiropractic in treatment of gastrointestinal problems.  

Fibromyalgia

Fibromyalgia is a somatic disease with chronic muscular pain and other disabling and debilitating symptoms, unknown etiology and poor efficacy of treatment. It is also a noticeable disease in traditional and complementary medicine. In a systematic review regarding the evaluation of chiropractic effectiveness in treatment of fibromyalgia, different chiropractic methods were compared with a waiting list (no treatment and also standard treatment), by assessing four clinical trials. Chiropractic demonstrated no significant difference with any other treatment mode; in general, there is not enough evidence regarding chiropractic effectiveness in treatment of fibromyalgia.  

Back Pain

In a systematic review regarding chiropractic effectiveness in treatment of low back pain, spinal manipulation was compared with pharmaceutical treatment, physical methods, training programs, sham chiropractic and no treatment. According to the results, chiropractic was superior to sham chiropractic and physiotherapy treatments, but it was less effective than pharmaceutical treatment and other therapies. Although the superiority of chiropractic to some treatments was shown in this study, only one of the studied researches was a high quality study based on the Jadad scale (Jadad score=5). Hence, it can be concluded that further researches with high quality research methodology are necessary to provide enough evidence supporting the effectiveness of chiropractic in treatment of low back pain.  

Carpal Tunnel Syndrome

According to the results of a systematic review carried out by Hunt, only the clinical trial conducted by Davis met the inclusion criteria. In this study, 91 patients aged 21 to 45 years were randomly divided into two groups. The first group of patients received chiropractic care accompanied by myofascial massage, ultrasound, and nocturnal wrist supports, while the second group received conservative conventional treatment,
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nocturnal wrist supports, and ibuprofen. The results of the study showed that there was no significant difference between the patients in the two groups; however, the reanalysis of between group differences carried out by Hunt in a systematic review revealed a significant difference in favor of the control group on the self reported measures of physical functioning and physical and mental distress. Therefore, there is not sufficient evidence regarding the effectiveness of chiropractic in treatment of carpal tunnel syndrome.31

It is also important to note that in the current study, only English chiropractic systematic reviews were evaluated. Therefore, language restriction was one of the study’s limitations.

The limitation of this article is that there is heterogeneity in some of the studies and also limited number of clinical trials in the assessed systematic reviews. Thus, conducting comprehensive studies based on more reliable study designs is highly recommended.

CONCLUSION

In conclusion, three points should be emphasized. Firstly, there is a discrepancy between the development of chiropractic in different countries of the world and the quality and quantity of studies regarding the effectiveness and safety of chiropractic in treatment of diseases. Secondly, some of the systematic reviews regarding the effectiveness of chiropractic in treatment of diseases had a minimum quality of research methodology and were not useful for evaluation. Some of the excluded articles are examples of this problem. Finally, a limited number of studies (11 systematic review articles and 10 diseases) had the required criteria and were assessed in the study.

Assessment and analysis of the studies showed the impact of chiropractic on improvement of some upper extremity conditions including shoulder and neck trigger points, neck pain and sport injuries. In the case of asthma, infant colic and other studied diseases, further clinical trials with larger sample sizes and high quality research methodology are recommended.

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