International Journal of
Recent Innovations in Medicine and Clinical Research
Open Access, Peer Reviewed, Abstracted and Indexed Journal

ISSN: 2582-1075
https://ijrimcr.com/
Volume-2, Issue-4, 2020: 9-21

Effectiveness of Manual Therapy in Cervical Spondylitis: A Systematic Review

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Received: September 10, 2020 **Accepted:** September 30, 2020 **Published:** October 6, 2020

Abstract: Background: Cervical spondylitis (CS) is a significant contributor to worldwide disability and poses a considerable financial burden to its stakeholders. Prognosis for chronic neck pain is generally poor, and the associated disability seems to be more persistent than low back pain. 66% of the population will suffer from neck pain at some point during their lifetime. More than one-third of people affected still have low grade symptoms or recurrences more than one year after treatment, often leading to chronic pain. More than one-third of those affected also show signs of mild pain or recurrence after 12 months of management, usually contributing to chronic pain. Different manual therapy methods and strategies exist; a common aspect is the use of hands during therapy which involves both manipulation and mobilization. **Aim:** To determine the recent research evidences for the effectiveness of manual therapy in cervical spondylitis patients. **Method:** This review includes randomized controlled trails (RCTs). Searching done by Google Scholar, PubMed and Pedro from 2010 to 2019. We used terms like-Neck pain, mobilization, manipulation, exercise, cervical spondylitis and physiotherapy management. **Result**: Present outcomes shows that manual therapy treatment is effective technique in reducing pain and increasing Range of motion (ROM) in CS patients without adverse effects. The search resulted in 100 articles but only 10 articles were selected for the study based on criteria. **Conclusion**: Manual therapy program designed for neck pain treatment can be more effective at increasing neck ROM and reducing pain.
Keywords: Manual therapy, Cervical Spondylitis, Exercise, Neck pain.

Introduction

Cervical Spondylitis (CS) is a major contributor to impairment globally and creates a tremendous financial threat to its participants. The prognosis for chronic neck pain is usually weak, and the resulting injury appears to be more severe than low back pain[1].

An approximate 66 percent of the population during their lifespan suffers from neck pain at any point during their lifespan. The second most frequent explanation given by patients for using complementary and integrative medicine (CIM) in 2007 was neck pain, followed only by low back pain[2]. The overwhelming amount of neck pain is not caused by endogenous anatomy, and it was called "non-specific" or "mechanical."

Non-specific cervical discomfort is responsible for a huge quantity of direct health insurance expenditures, referrals to primary health facilities, leave due to illness, and the associated lack of productivity[3,4]. Most of the non-specific neck pain is not related to neurological symptoms of nerve compression or with significant illness. In few cases, non-specific cervical discomfort is seldom interfering with activities of daily living. Non-specific cervical discomfort poses a significant impediment to normal functioning[5]. More than one-third of those affected also show signs of mild pain or recurrence after 12 months of management, usually contributing to chronic pain[6].

Mechanical neck pain is characterized as a generalized neck pain with or without mechanical features of the shoulder, including symptoms created by sustained posture of the neck, movement, or cervical muscle palpation. In the cervical region, mechanical neck pain is pain, often followed by decreased range of motion (ROM) and physical disability. Neck pain and its associated disease pose a considerable socioeconomic strain on society[7].

EMG bio-feedback, electrical stimulation, thermotherapy, acupuncture, therapeutic exercises, or combination therapies for intense neck pain are not indicated. Manipulation, mobilization and rehabilitation are favored over standard treatment in order to reduce intense neck pain at short-term follow-up[8]. Different manual therapy methods and strategies exist; a common aspect is the use of hands during therapy which involves both manipulation and mobilization[7]. Studies also shown that manual therapy approaches offer sufficient relief for neck pain[9.10,11]. Such methods include manipulation (i.e. a high speed thrust targeted at spine joints) and mobilization methods that do not require a high speed thrust. Professionals challenge whether abuse of the neck will do more damage than good[12]. Maitland's proposed joint mobilization focuses on the assessment and management of passive oscillatory and rhythmic movements. The assessment is done by palpating and passively moving the area to be treated[13]. Depending on the degree of accessory movements within in the joints, the passive movements are divided into 5 levels. In Grades I and II slow are applied in the early ROM in regions where pain was assessed. Grades III and IV are applied at the end of range, or from the restriction provided by the peri-articular tissues to preserve mobility of joint in the existence of restriction. In Grade V small amplitude with high speed oscillatory movements are applied, also known as manipulation.

Maitland's sessions are in 4 situations, when the individuals can have acceptable outcomes on condition that they follow gaps between each of the four sessions. It shows that there are 2 to 3 days between the 1st and 2nd cycles; the 2nd to 3rd three to 4 days; the 3rd to last 5 to 7 days[14].

Methods

This review study is performed in accordance to PRISMA- Preferred Reporting Items for Systematic Reviews and Meta‐Analyses[15]. PRISMA statement attached as Appendix I (PRISMA Checklist).

Search Strategy

The searching was done in PubMed, Google Scholar and PEDro. Key words like- Neck pain, mobilization, manipulation, exercise, cervical spondylitis (CS) and physiotherapy management. We included past 10 years articles (mainly RCTs-Randomized controlled trial) published in English language only from 2010-2019.

The title and abstracts of all articles in the searches were screened in accordance with the inclusion and exclusion criteria to identify potentially eligible articles. Full texts of potential articles were read and assessed independently by the two reviewers.

Inclusions criteri[16]

In this review RCTs articles were used only

- ✓ If they posed low prejudice chances.
- ✓ Where patients with Neck Pain have been allotted randomly to take Manual Therapy or a "no-treatment" group, placebo or additional typical traditional treatment for neck Pain.
- ✓ Where instructions for random allocation is necessary and clearly specified.
- ✓ Where single-blind assessor or double-blinded assessor design was used.
- ✓ Both male and female patients between 18-60 years of age with acute/sub-acute (<3monts) and chronic (> 3 months) Neck Pain were utilized.

Exclusion criteria[16]

- ✓ Any other languages than English.
- ✓ Any report conducted prior to 2010 was omitted from the survey.
- ✓ Articles left out they did not adhere to Mulligan's MWM for neck is.
- ✓ Spinal cord research, chiropractic, livestock, and other non-original medical findings have been excluded.
- ✓ The study also omitted studies that did not specifically relate to mobilization with neck mobility or the treatment of musculoskeletal disorders.

Quality assessment

Methodological quality of selected articles was assessed using PEDro Scale[17] consisting of 11 questions in two aspects. Criteria 2-9 assess internal validity and criteria 10-11 assess statistical information required to make a study interpretable Scoring of each question is done in accordance to its existence or nonexistence in the assessed study. The final scoring is done by the addition of all positive answers.

Studies considered of high quality scoring ≥5 (5/10) as stated by Moseley et al[18]. Therefore in our review all included studies scoring ≥5 were found to be of high in methodological quality. The studies were analyzed in PEDro scale by two independent investigators.

Data Analysis

The screening of included articles was done by two independent investigators. The selected articles were analyzed in an organized manner including parameters given: author-year, study design, subjects-age, interventions, study duration, outcome measures, and results. Differences between the investigators were solved by conversation to reach agreement and settled by using Cohen's kappa statistics.

Intervention

Considered experiments are those which involve mobilization, Manipulation, different types of exercise irrespective of strength and durations. Exercises programs included, strengthening exercises, flexibility exercises, stretching exercises.

Results

Studies identified

After implementing the inclusion and exclusion criteria, 100 articles were retrieved using the keywords-Neck pain, mobilization, manipulation, exercise, cervical spondylitis and physiotherapy management. 65 articles were excluded as they were found in more than one database. For eligibility criteria 35 articles were screened. Further 25 articles excluded because either they were not available in full text, objective not available, they did not meet exclusion and inclusion criteria or no control group (Figure-1). Finally, 10 articles were selected by agreement for quality assessment phase.

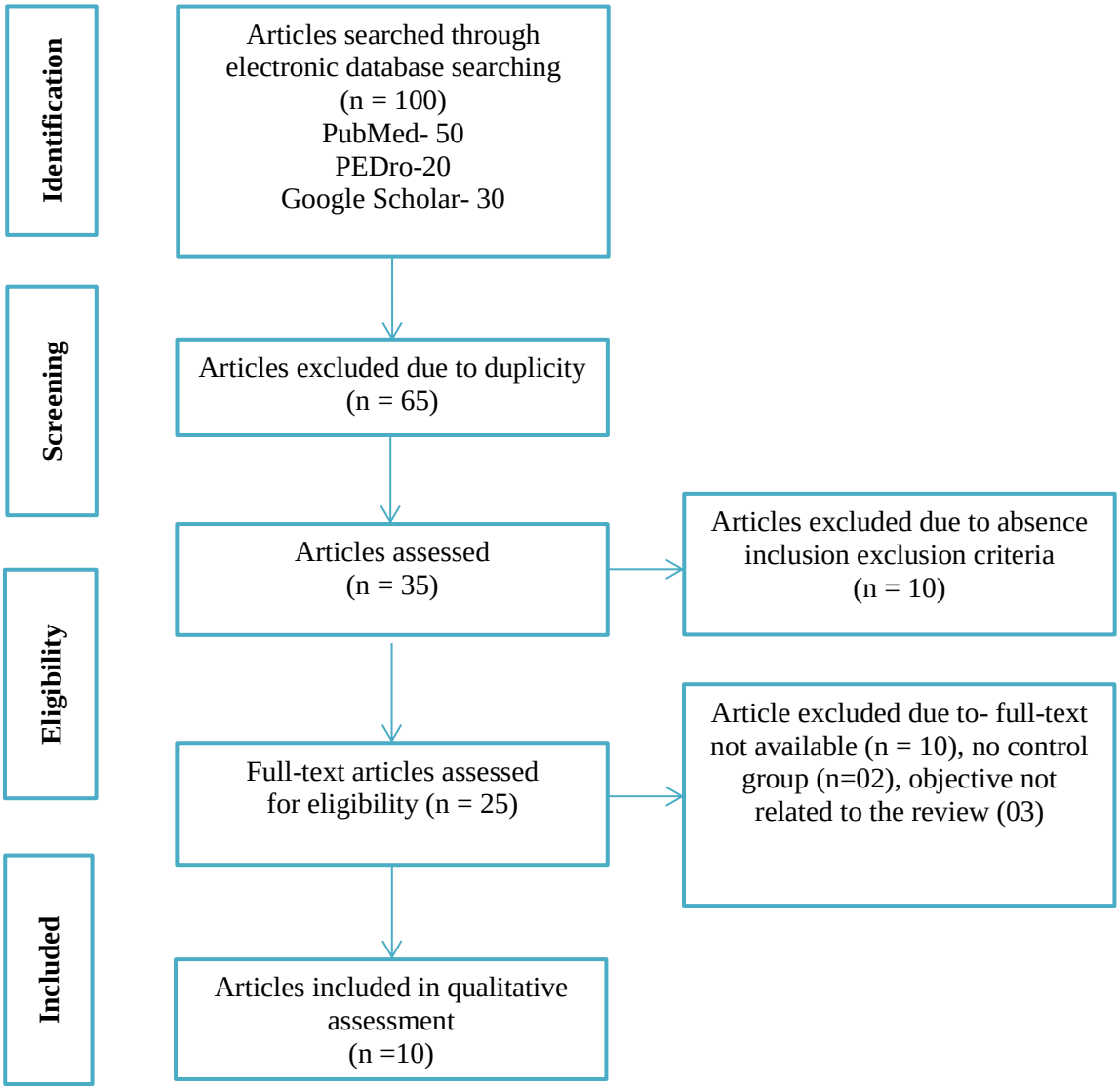

Figure 1. Flow diagram showing the screening and selection of articles

General data of the included studies

Selected articles in this review are summarized in Table 1 including given parameters: author-year, study design, subjects, interventions, study duration, outcome measures, and results. All 10 studies included in this study were RCTs[19-28]. All studies were conducted between 2010 and 2019.

Number of participants in the studies ranged from 18 to 200. All articles were experimental. Concerning the efficacy of results established in the most of the articles, both manipulation and mobilization were found to be significantly effective on pain and function between pre- and post-intervention assessments.

Outcome Measures

The key result tests are VAS, NDI, Goniometry, BDI, Short Form-36, individuals Specific Functional Scale, 12-Item Short-Form Health Survey Physical and Behavioral portion Summaries, DUALER IQ PRO (JTECH Medical, U.S.A.).

Table 1. Description of the included studies

Author	Study design	Subject	Intervention	Study Duration	Outcome measure	Result
E.B. Lohman, G.R. Pacheco et al. 2018[19]	Randomized controlled trial	N=28	Group I: Cervical spinal manipulation (CSM) Group II: Sham group (sham manipulation)	One time study.	NDI, NPRS, Perceived Stress Scale	The results of the current study suggest that the mechanical stimuli provided through a CSM may modify neuropeptide expression by immediately increasing the serum concentration of nociception-related biomarkers (oxytocin, neurotensin, orexin A, but not cortisol) in the blood of female subjects with non-specific mechanical neck pain.
Abdullah Al Shehri, Shabana Khan et al. 2018[20]	Randomized controlled trial	N=50	Group A: This group received conventional therapy (Active, Isometrics exercises, moist hot packs) plus SNAG Group B: This group received conventional therapy (Active, Isometrics exercises, moist hot packs) plus Maitland's mobilization	Duration of study is four weeks, three sessions per week & one session per day.	VAS, NDI, Goniometry for Cervical Range of Motion	In this article, individuals were treated with Maitland mobilization and conventional therapy, and Mulligan (SNAGs) mobilization and conventional therapy in both groups. Both mobilization techniques are clinically significant in reducing the individual's symptoms. But Maitland mobilization is statistically significant in decreasing the individual's symptoms when it is compared Mulligan SNAGs mobilization.
Muhammad Nazim Farooq, Mohammad A. Mohseni-Bandpei, et al. 2018[21]	Randomized controlled trial,	N=68	Group A: Multi-modal mobilization Group B: Routine physiotherapy.	10 sessions for 4 weeks	VAS,NDI, Neck flexor muscle endurance test and universal goniometer	The results suggest that a combination of cervical mobilization with routine physiotherapy is more effective for reducing pain and disability and improving NME and neck ROM in patients with chronic mechanical NP compared to routine physiotherapy alone.
Muhammad Tariq Rafiq, Zahoor Elahi et al. 2016[22]	Randomized controlled trial	N=200	Group-A: This groups participants received mobilization alone Group-B: This	Mobilization and/or exercise sessions were performed 3-4 times a	VAS, NDI	In the present study researcher found that the combination procedure, mobilization + exercise, was the safest therapeutic choice for

			groups participants received exercise therapy alone. Group-C: This groups participants were received combined therapy of mobilization and exercise.	week.		neck pain and spasm patients. Though mobilization was best for treating neck pain and spasm patients, it was more successful than exercise. Therefore it was found that combination treatment, mobilization + exercise was the safest therapeutic choice for neck pain and spasm patients.
Thavatchai Suvarnnato, Rungthip Puntumetakul 2013[23]	Randomized controlled trial	N=39	Group-A: Single level thoracic manipulation Group-B: Single level thoracic mobilization, or a control group	One time Study with 24-hour follow-up.	VAS, Cervical Range of Motion (CROM) device,	The study demonstrated reductions in VAS pain ratings and increases in CROM at immediate and 24-hour follow-ups from both single level thoracic spine manipulation and thoracic mobilization in chronic neck pain.
Keun Su Lee, Joon Hee Lee 2017[24]	RCTs	N=18	Group A: In this group only therapeutic exercise was applied to the upper thoracic & cervical spine. Group B: In this group joint mobilization & therapeutic exercise were applied.	Therapy was given for one hour a day, 3 times a week, for 2 weeks for each group	VAS, neck disability index, ACROM, static balance capacity, & muscle tone were assessed.	In both groups VAS, NDI, & ACROM is improved significantly. Group B improved significantly more on right lateral flexion and rightward rotation. Muscle tone improved significantly in the upper trapezius in both groups. In addition, the group which receive both joint mobilization and therapeutic exercise were applied, significantly more improvement in the pain index, NDI, and ACROM was seen than in the group that received only therapeutic exercise.
Rajesh Gautam, Jagdeep Kaur Dhamija et al. 2014[25]	Randomized controlled trial	N=30	Group-A: Conventional therapy Group-B: Maitland mobilization techniques Group-C: Mulligan mobilization technique	Four session in one week for total of 30 days.	Pain, disability and ROM were assessed by VAS, Neck Disability Index and universal goniometer.	This research has shown that mulligan mobilization is more effective in improving pain, ROM and disability. While both study groups showed decreased pain , disability and improved ROM, it was observed that mulligan mobilization was more effective in improving pain, ROM and disability.
Sang-Hak	Randomized	N=23	Passive group:	One time	Visual	There are significant

Kim, Jin-Ho Choi et al. 2016[26]	controlled trial		Kaltenborn's joint Mobilization (12 patient's) Active group: Olaf's Auto-stretching (11 patient's)	study	Analogue Scale, DUALER IQ PRO (JTECH Medical,U.S. A.) was used to measure the neck ROM.	difference in the pain and the ROM in both of two group ($p<.05$). But there are no significant difference pain and ROM between two groups.
Hossam alden al-bassiouny, Salwa shendy et al. 2019[27]	Randomized controlled trial	N=30	Group-A: Received upper thoracic mobilization and traditional physical therapy program. Group-B: Received the traditional physical therapy program only (IR 15 min, TENS, Stretching exercises for Upper Trapezius, Levator Scapulae, Sternocleidomastoid and Scalenes muscles, each stretching exercise maintain 30 second and repeated 5 times for each side.	Both groups were received a traditional program for 4 weeks, 3 sessions per week.	Pain level was measured by a Visual Analog Scale (VAS) and neck disability was measured by Neck Disability Index (NDI).	There is a statistical significant difference between both groups. There is a positive effect of upper thoracic mobilization on CROM and neck function when comparing with routine physical therapy, there was no a statistical significant effect of upper thoracic mobilization on resting pain level when compared with routine physical therapy.
Anupama Prabhu,Ravi Shankar Reddy et al. 2011[28]	Randomized controlled trial	N=28	Group-A: Moist heat, thoracic thrust manipulations and cervical mobilization Group B: Moist heat, thoracic thrust manipulations	Total 5 session	VAS, CROM, NDI.	Both cervical mobilization and thoracic thrust mobilization was effective in the management of MNP. Cervical mobilization was not superior to thoracic thrust manipulation alone in the management of MNP.

Discussions

This review was conducted to determine the efficacy of manual therapy approaches in improving quality of life in patients with neck pain. Evidences from RCTs is used to assess the efficacy of manual therapy approaches in neck pain. There is low to intermediate quality proof that different forms of manipulation and/or mobilization can alleviate pain and improving function for chronic neck pain relative to other treatments. Several prior studies of chronic neck pain show findings in favor of manipulation and mobilization for individuals with chronic neck pain. However, most of these studies also report that methodological flaws render the evidence insufficient or inconclusive, making it inappropriate to conclude that manipulation and/or mobilization are more effective compared to usual care or other complementary and integrative medicine therapies. In addition to above mentioned evidences, researchers mentioned below also proved manual therapy interventions to be equally effective in decreasing pain and improving ROM in patients with neck pain.

According to Kattela Suneel Kumar et al. therapeutic use of neural mobilization in to cervical traction therapy decreased discomfort and raise ROM in Comparison of post treatment indicates at 2nd and 4th week of therapy there is a statistically improvement ($p<0.05$) difference in improvement in outcome measures between three groups[29].

Adem Yildirim et al. showed on his research that cervical and scapular mobilization procedures have beneficial effects on pain scores head of neck as well as local tenderness scores and endurance of cervical muscles. In addition, these applications may improve neck disability and state anxiety scores of patients with MPS[30].

Evans et al. studied the effectiveness of manual therapy (MT1 HVLA manipulation) (to the Cx and Tx for 20 sessions of 15–20 minutes) paired with high dose (20 sessions of 1-hour) controlled strengthening exercise (neck and upper body strengthening), versus moderate dose controlled strengthening exercise alone, and low dose home exercise and instruction for chronic NP individuals. There were clinically significant result at 12 weeks for both high dosage exercise groups for pain and general health benefits ($p<0.001$) in relation to home exercise and a tendency for impairment for MT1 associated with exercise activity towards home exercise. The authors concluded that high dose exercise combined or not with MT1 achieved better outcomes than home exercise especially in the mediumterm (3 months)[31].

Saptute et al. in the first comparative category; even though an exercise plan was introduced on the first control group, making it an successful therapeutic strategy, the same exercise protocol was also introduced on the study group that additionally adopted Mulligan's MWM. Thus, MWM represented the only aspect upon which the discrepancies between the groups were contingent. Furthermore, it appears that MWM of peripheral joints, as defined in the Mulligan definition, yields better therapeutic outcome in contrast to a false, passive or no therapeutic solution regarding disability reduction. The outcomes collected from this comparison also appear to be clinically significant[32,33].

Leticia Bojikian Calixtre et al. on his research he observed that the cervical spine therapy treatment involving neck joint mobilization, muscle stretching, and segmental stabilization appears to include significant change in pain-free MMO, self-reported discomfort, and mandibular functioning in subjects with myofascial pain or mixed Temporo mandibular disorders (TMD). Changes showed moderate-to-large effect sizes but small magnitude and no clinical relevance. Nonetheless, the direction of the findings suggests that additional research will start exploring the impact of cervical therapy in subjects with TMD. It will bring up stronger evidence about the indirect approach of TMD by physical therapists[34]. Diana Gregoletto et al. research had mechanical neck pain and limited cervical ROM in at least one cervical movement. The finding of this study indicate that spinal manipulation, using the Gonstead and Diversified DTV techniques, in the cervical and thoracic spine, may indicate a subjective reduction in pain and produce a significant improvement in neck ROM in individuals with mechanical neck pain[35]. Thavatchai Suvarnnato et al. research validated decreases in VAS pain scores and increases in neck ROM at instant and 24-hour follow-ups from both single level thoracic spine manipulation and thoracic mobilization in chronic neck pain[23].

Conclusion

This systematic review was conducted to investigate the effectiveness of manual therapy methods designed to improve pain and ROM in cervical spondylitis patients by summarizing the evidences from randomized controlled trials (RCTs). We conclude that manual therapy program designed for cervical spondylitis treatment can be more effective at increasing neck ROM and reducing pain. In addition, CS patients can improve self-reported with isometric exercises including ROM exercises, either with or without electrotherapy.

Conflicts of interest

There are no conflicts of interest.

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Appendix I- PRISMA Statement

Section/topic	**#**	**Checklist item**	**Reported on page #**
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	
Data items	11	List and define all variables for which data were sought	

		(e.g., PICOS, funding sources) and any assumptions and simplifications made.	
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	
FUNDING			

Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	
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Citation: Alanazi MA, Albaqamy KA. Effectiveness of Manual Therapy in Cervical Spondylitis: A Systematic Review. Int J Rec Innov Med Clin Res. 2020;2(4):9-21.