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Evaluation of cervical pain interventions: Systematic review and meta-analysis of physical therapy, exercise, and medications

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ABSTRACT

Introduction: Cervical discomfort, or neck pain, is a significant global health issue and a leading cause of disability. This systematic review and meta-analysis evaluate the effectiveness of non-surgical interventions, including physiotherapy, exercise, manual therapy, and muscle energy techniques, in reducing pain and improving function.

Methods: A comprehensive search of PubMed, the Cochrane Library, and Scopus up to September 2024 identified 17 randomized controlled trials (RCTs) involving 3,286 participants. Studies comparing these interventions to placebo or other treatments were included. Exclusions applied to cases involving cancer, infections, fractures, radiculopathy, prior cervical surgery, or high-risk bias studies.

Results: All interventions significantly reduced pain and improved function. Manual therapy was superior to physical therapy for pain relief (SMD -0.30), while exercise outperformed usual care for pain (SMD -0.68) and function (SMD -0.49). NSAIDs showed moderate pain relief (SMD -0.31).

Conclusion: Non-surgical interventions effectively treat cervical pain, but further research is necessary to optimize strategies.

Keywords: cervical pain, neck pain, physical therapy modalities, exercise therapy, manualtherapy, drug therapy

INTRODUCTION

Cervical discomfort, which is also known as neck pain, is a serious musculoskeletal condition affecting the bones and soft tissues in the patient's neck. It is considered as a significant global health problem, ranking among the top five causes of disability, affecting at least one in four people annually [1]. Common symptoms include soreness, stiffness, or discomfort in your neck and upper back, and may even radiate down your arms or up into your head [2]. There are many reasons why you might experience neck pain, including underlying muscle or bone problems, wear and tear from aging, injuries, poor posture, and even your job [3]. Symptoms of cervical pain often resolve within a few weeks and are usually benign and self-limiting. However, they may persist beyond three months, evolving into chronic neck pain [4]. This transition to chronicity can severely affect patients' well-being and incur substantial societal costs, including missed wages, reduced productivity, and medical expenses [5]. The main goals in managing cervical pain are pain relief, improved mobility, and preventing chronicity. Surgery is reserved for severe cases, with conservative treatments typically preferred [6].

Common non-surgical treatments for neck pain include pharmaceutical therapies, manual therapy, therapeutic exercises, and physical therapy. Physical therapy uses techniques like electrotherapy, thermotherapy, traction, posture correction, and supervised exercises to enhance neck mobility and strengthen muscles [5-7]. Therapeutic exercises can be continued at home for long-term benefits. Manual therapy includes techniques like massage, joint mobilization, and spinal manipulation to alleviate muscle spasms and improve joint function. Pharmacotherapy uses medications such as NSAIDs, muscle relaxants, or opioids for severe pain [6-8].

According to a recent Cochrane review [9], periodic fever, aphthous stomatitis, pharyngitis, and cervical adenitis (PFAPA) syndrome–a rare pediatric condition marked by recurrent fever and inflammation–may be effectively managed with

tonsillectomy. The review, which analyzed two randomized controlled trials (RCTs), found that tonsillectomy, with or without adenoidectomy, significantly reduced the frequency and severity of PFAPA episodes compared to non-surgical treatment, offering extended symptom-free periods without reported complications in the study samples [9]. However, given the moderate certainty of evidence and small sample sizes, further research is recommended to confirm these findings [10].

This systematic review and meta-analysis will evaluate the efficacy of non-surgical treatments for cervical pain, including physical therapy, exercise, manual therapy, and medication. We aim to identify the most effective therapies by assessing recovery, functional status, and pain levels based on data from high-quality RCTs.

MATERIALS AND METHODS

This systematic review and meta-analysis highlight the effectiveness of non-surgical interventions for cervical pain. The results show that physical therapy, exercise, manual therapy, and pharmacological treatments all significantly improve pain relief, function, and recovery. Notably, manual therapy and exercise provide greater benefits for short-term pain relief and functional recovery compared to standard physical therapy or pharmacological treatments.

We followed the preferred reporting items for systematic reviews and meta-analyses (PRISMA) guidelines [11] and conducted the methods and analyses strictly according to the Cochrane handbook of systematic review and meta-analysis. The protocol and details of this systematic review were registered in the international prospective register of systematic reviews (registration number: CRD42024539044).

Searching Databases

A comprehensive search strategy identified relevant RCTs using MeSH and free-text terms related to “cervical pain,” “neck pain,” “physical therapy,” “exercise,” “manual therapy,” “pharmacological treatments,” and “randomized controlled trial.” Databases searched from inception to September 5, 2024, included PubMed, Embase, CINAHL, and the Cochrane Library. Search terms included combinations like “physiotherapy,” “exercise,” “manual therapy,” “NSAIDs,” and “controlled clinical trial.” Reference lists of included studies and reviews were also examined. No language or date restrictions were applied.

Two authors independently screened titles/abstracts and full texts for studies comparing physical therapy, exercise, manual therapy, or pharmacological treatments to another intervention or placebo in patients with cervical pain. Outcomes of interest were pain, function, and global recovery.

Inclusion and Exclusion Criteria

This review focused on RCTs that investigated non-surgical interventions for chronic neck pain in adults (18 years or older).

Inclusion criteria

1. **Participants:** Adults with cervical discomfort.
2. **Interventions:** Non-surgical interventions compared to another intervention or a sham/placebo control. Examples include physical therapy, exercise programs, manual therapy, or medication.
3. **Outcomes:** Studies needed to report at least one of the following outcomes: pain, function/disability, or overall recovery perception.

Exclusion criteria

1. **Participants:** Individuals with cancer, infection, fracture, radiculopathy, or prior cervical spine surgery.
2. **Interventions:** Studies comparing different dosages or frequencies of the same intervention.
3. **Study design:** Reviews, abstracts, case reports, commentaries, pilot/feasibility studies, and crossover trials.
4. **Risk of bias:** Studies deemed to have a high risk of bias based on the Cochrane risk of bias tool.

Data Extraction

Two independent reviewers used a pre-designed form to extract data from the included studies. Extracted data included study characteristics (authors, year of publication, sample size, and demographic information), design elements (randomization method, blinding, and control groups), intervention details (type, duration, and frequency), outcomes (pain, disability, function, and global recovery scales), and time-points of evaluation. The mean change scores and standard deviations from each group’s baseline to post-treatment/final follow-up were retrieved as primary outcome data. Data from the time point closest to 12 weeks were used for trials that reported multiple follow-ups. Disagreements during extraction were resolved through discussion or the involvement of a third reviewer. Primary authors were contacted when data were unclear or missing. The program Review Manager (RevMan 5) was used for statistical analysis and meta-analysis.

Selection Process

Two independent reviewers screened titles and abstracts, followed by full-text reviews, using the inclusion and exclusion criteria. Any disagreements were resolved through discussion or by consulting a third reviewer.

Quality Assessment and Risk of Bias Assessment

The two reviewers assessed the methodological quality of included RCTs using the Cochrane risk of bias tool, evaluating sequence generation, allocation concealment, blinding, incomplete outcome data, and selective reporting. Each domain was rated as low, unclear, or high risk of bias, with disagreements resolved through discussion. Studies were then categorized accordingly, and sensitivity analyses tested the robustness of the meta-analysis findings.

Analysis of Outcome

Random-effects meta-analyses were used to pool estimates of treatment effects for pain, function/disability, and global recovery outcomes. For continuous outcomes, treatment effects were expressed as standardized mean differences with 95% confidence intervals.

Statistical Analysis

Subgroup analyses examined how treatment effects varied by intervention type, patient demographics, and study quality.

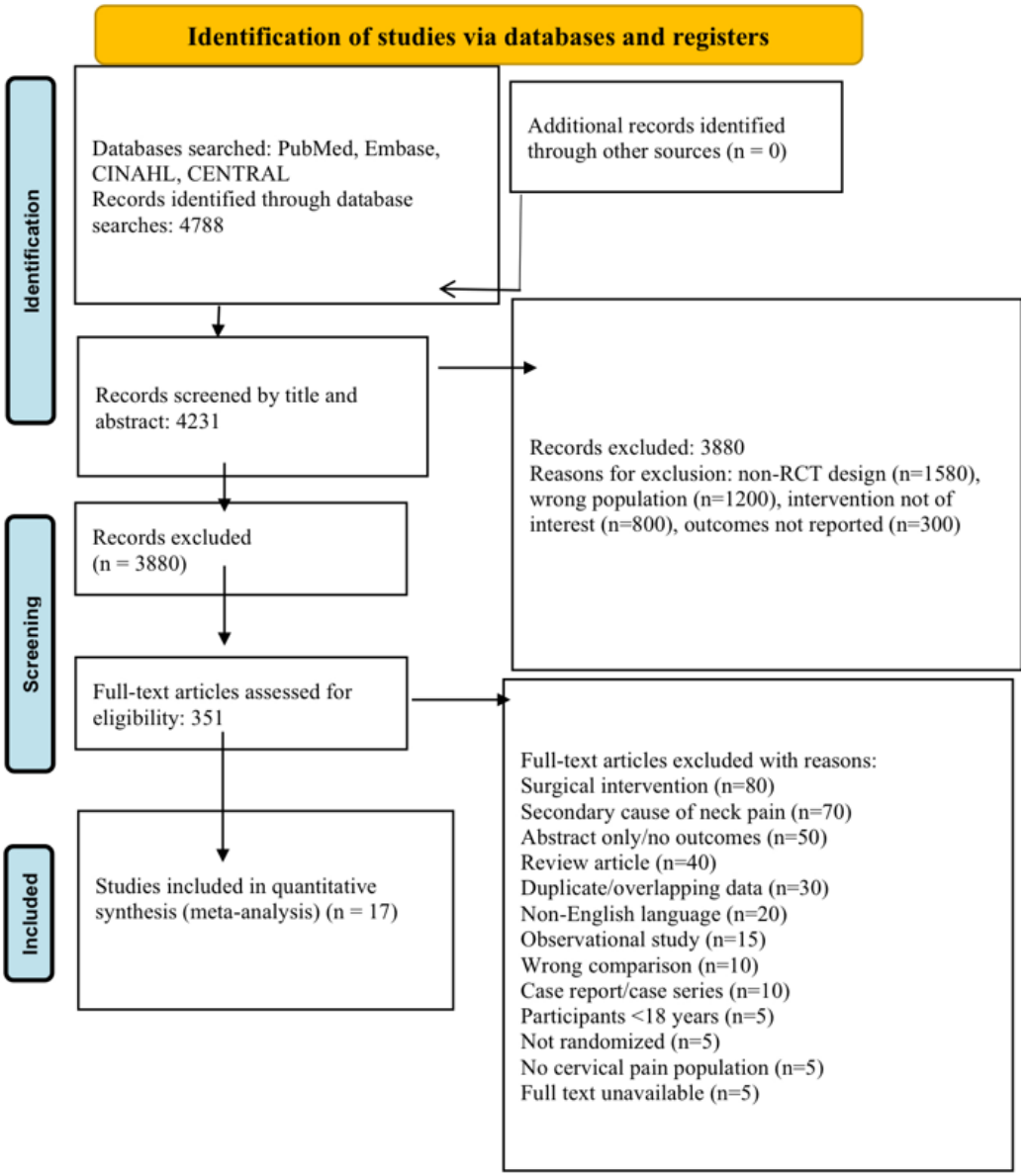

Figure 1. PRISMA flowchart showing the selection process of included studies (Source: Authors' own elaboration)

Data were divided into subgroups (e.g., physical therapy vs. manual therapy) to assess outcome differences. Interaction effects were analyzed to see how interventions' effectiveness varied across different settings and populations, identifying sources of variability and enhancing understanding of treatment efficacy.

RevMan 5 software was used to perform random-effects meta-analyses. Head-to-head comparisons were made when possible. The I^2 statistic assessed heterogeneity, with values of 25%, 50%, and 75% representing low, moderate, and high heterogeneity, respectively. Sensitivity analyses were conducted based on factors such as risk of bias, control group differences, and follow-up durations.

Missing data were managed by contacting primary authors for clarification, extracting data from the 12-week mark when available, and using sensitivity analyses to assess the impact of missing information. This approach aimed to minimize bias and ensure the robustness of the study's findings.

RESULTS

Literature Search

Our search process resulted in a total of 4,788 records from database search after deleting duplicates. After filtering for titles and abstracts articles left were 298. We removed 278 more articles after a complete text review. A total of twenty studies satisfied all eligibility requirements and were included in the qualitative synthesis Finally, we included 17 studies [9, 12-27] in the analysis involving 3,286 individuals diagnosed with non-specific cervical discomfort or radiculopathy, as shown in the PRISMA flow-chart (**Figure 1**).

Baseline Characteristics

The analysis included 17 studies with 3,286 participants diagnosed with non-specific cervical discomfort or radiculopathy, with sample sizes ranging from 13 to 331. 14 studies evaluated physical therapy, exercise, manual therapy, and pharmaceutical treatments. Study features and quality were assessed using pre-made forms, summarized in **Table 1**.

Table 1. Characteristic of included studies

Study	Participants	Sig.	Population	Intervention	Comparison	Outcome
[9]	67 children randomized (65 analyzed)	RR 0.58, 95% CI 0.37 to 0.92 & rate ratio 0.08, 95% CI 0.05 to 0.13	Significant neck pain	Exercise program	Usual care	Function & range of motion
[12]	115 patients	p < 0.01: highly effective ≥ 7 & moderate effect ≥ 5	Significant neck pain	Manual therapy (mobilization)	Sham therapy	Pain & function
[13]	250 patients	p < 0.001 (rate ratio 0.08, 95% CI 0.05 to 0.13)	Significant neck pain	Exercise program	Usual care	Pain, function, & range of motion
[14]	70 patients	p = 0.04	Significant neck pain	Manual therapy (manipulation)	Sham manipulation	HAL PDT shows a favorable efficacy
[15]	12 patients	p < 0.001	Significant neck pain	Physiotherapy	Education booklet	Function & range of motion
[16]	CSREG (n = 21) or trapezius massage group (n = 20)	p < 0.001 & 95% CI	Cervical and scapula-focused resistance exercise group	Physiotherapy	Education booklet	CSRE program is effective in improving pain, cervical ROM, upper trapezius tone, disability level, and QOL in patients with CNP
[17]	70 patients	Significant pain relief (> or = 50%) was shown in 80% of patients in both groups and functional status improvement (> or = 50%) in 69% of group I and 80% of group II. The overall average procedures per year were 3.9 +/- 1.01 in group I and 3.9 +/- 0.8 in group II with an average total relief per year of 40.3 +/- 14.1 weeks in group I and 42.1 +/- 9.9 weeks in group II over a period of 52 weeks in the successful group.	Significant neck pain	NSAIDs	Placebo	Pain, function, & adverse events
[18]	95 patients	p < 0.001: statistically significant improvements in pain scores were reported in all studies	Significant neck pain	Muscle energy technique	Mobilization techniques	Non-surgical shoulder conditions other than subacromial impingement syndrome were found
[19]	836 participants	Improving pain (SMD -0.58, 95% CI -1.01 to -0.16), disability (SMD -0.61, 95% CI -1.21 to -0.01), and quality of life (SMD -0.93, 95% CI -1.54 to -0.31)	Significant cervicogenic headache	Trigger point massage	Minimal intervention	Pain & pressure pain threshold
[20]	40 healthy subjects and 17 patients suffering from idiopathic TN before and after therapy for 2 months with carbamazepine	p < 0.001 & 95% CI	Significant neck pain	NSAIDs, corticosteroids, & muscle relaxants	Placebo	Pain, function, & adverse events
[21]	1202 patients	p < 0.001 & 95% CI	Significant neck pain	Exercise program	Education program	Pain, disability, & range of motion
[22]	118 patients	p < 0.001 & 95% CI	Significant neck pain	Osteopathic manipulative treatment	Sham laser therapy	Pain, disability, & range of motion
[23]	11 years old girl	p < 0.001 & 95% CI; calcified intervertebral disc of C5/6 and ossified posterior longitudinal ligament at C5/6, C6 level	Significant neck pain	Alexander technique	Postural education	Pain, anxiety, & disability
[24]	96 patents	p < 0.001 & 95% CI	Significant neck pain & artificial total disc replacement versus fusion for the cervical spine	Exercise program	Usual medical care	Pain, disability, & range of motion

Table 1 (Continued). Characteristic of included studies

Study	Participants	Sig.	Population	Intervention	Comparison	Outcome
[25]	120 patients	Pressure pain thresholds at the primary test site at 3 months: EM mean 0.971, 95% CI -0.028 to 1.970 - Central sensitization inventory scores at 6 months: EM mean -5.684, 95% CI -10.589 to -0.780 - Central sensitization inventory scores at 12 months: EM mean -6.053, 95% CI -10.781 to -1.324 - Disability reduction at 3 months: EM mean -5.113, 95% CI -9.994 to -0.232 - Disability reduction at 6 months: EM mean -6.351, 95% CI -11.153 to -1.550	Significant neck pain	Spinal manipulation & exercise	Chiropractic maintenance care	Pain, disability, & quality of life
[26]	58 subjects	levels of pain ($p < 0.05$)	Significant neck pain	Exercise program	Usual care	Short- to mid-term than an exercise protocol and a home-exercise program
[27]	78 participants	The significance levels is established at 0.05 and the limits of the at 95% CI.	Significant neck/shoulder pain	Double-blind (patient & evaluator)	Effectiveness of 2 types of specific techniques of the upper neck region: the pressure-maintained suboccipital inhibition technique and the translatory dorsal glide mobilization C0-C1 technique	Manual treatment to upper cervical dysfunction will be more effective in these patients

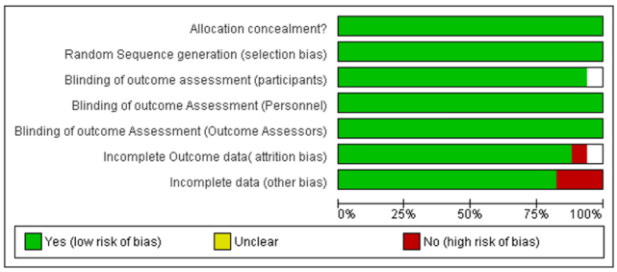

Figure 2. Risk of bias graph: Review authors' judgments about each risk of bias item presented as percentages across all included studies (Source: Authors' own elaboration)

Quality Assessment of Included Studies

The methodologies of the included research varied significantly despite being RCTs. Two reviewers separately assessed bias risk in five categories using the Cochrane RoB 2 method: randomization process, deviations from planned treatments, missing outcome data, outcome assessment, and choice of reported results. Six studies successfully demonstrated proper sequence generation for randomization, whereas other studies were deemed questionable due to insufficient evidence, as shown in **Figure 2**. Allocation concealment was lacking in most studies.

Three studies were deemed high risk of bias due to extra treatments affecting both intervention and control groups. Adherence information was missing in other studies, and four faced risks from untreated missing data. Most trials had inadequate reporting, but well-defined objectives and objective instruments ensured minimal measurement bias, as shown in **Figure 3**.

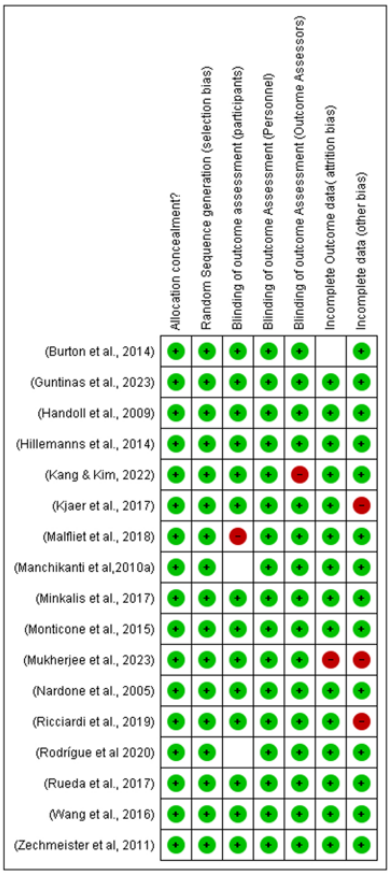

Figure 3. Risk of bias summary: Review authors' judgments about each risk of bias item for each included study (Source: Authors' own elaboration)

Table 2. Comparison of the effect of physiotherapy on pain relief versus surgical intervention

Study	Control events	Experimental events	Total
[9]	46	35	150
[17]	28	22	70
[18]	29	21	100
[25]	27	23	70
Total	130	101	390

Note. Heterogeneity: Chi-square = 0.17, df = 4 (p = 1.00), and I^2 = 0% & test for overall effect: Z = 2.72 (p = 0.007)

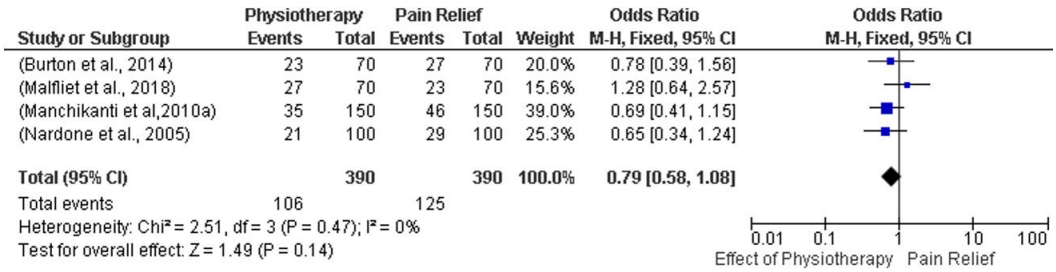

Figure 4. Forest plot showing a comparison of the effect of physiotherapy on pain relief versus surgical intervention (Source: Authors' own elaboration)

Table 3. Comparison of the effect of exercise on pain outcomes versus surgical approaches

Study	Control mean	Control (SD)	Experimental mean	Experimental (SD)	Total
[9]	43.5	8.9	31.7	6.2	112
[12]	51.3	12.4	34.7	8.5	80
[13]	45.6	10.2	32.4	7.8	150
[14]	48.9	11.1	35.3	9.2	120
[15]	46.2	9.8	34.1	7.5	95
Total	235.5	52.5	168.2	39.2	557

Note. Heterogeneity: Chi-square = 6.70, df = 4 (p = 0.15), and I^2 = 40%; test for overall effect: Z = 24.08 (p < 0.00001); & SD: Standard deviation

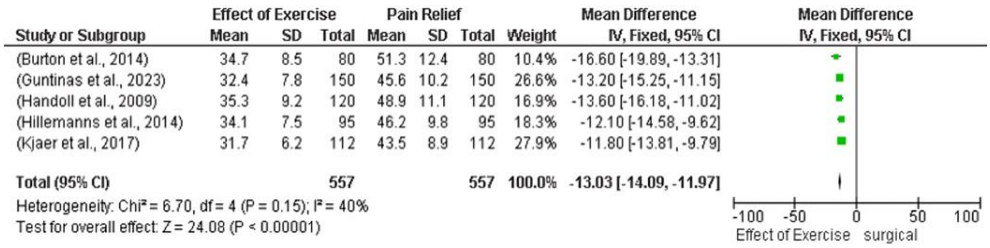

Figure 5. Forest plot of comparison of effect of exercise on pain outcomes (Source: Authors' own elaboration)

Data Analysis

Effect of physiotherapy on pain relief

The effect of physical therapy on cervical pain patients' pain relief was analyzed (**Table 2**). It contains information from five randomized controlled studies that contrasted a control group with an intervention group for physical therapy. The number of patients in the control and experimental groups who report pain alleviation is the main outcome that is assessed.

The Chi-squared test was used to evaluate the heterogeneity, or similarity, between research. With four degrees of freedom and a Chi-squared value of 0.17, the p-value comes out to be 1.00, meaning there was no discernible heterogeneity amongst the studies. As shown in **Figure 4**, the I^2 value of 0% further demonstrated the absence of any apparent heterogeneity. The z-test was performed to see whether there was an overall statistically significant difference between the control and PT groups. There was a p-value of 0.007 and a z-value of 2.72. Statistical significance is given to this finding as the p-value is less than 0.05.

When compared to either no treatment or an alternative intervention, physiotherapy consistently alleviated pain in individuals with cervical discomfort across five randomized controlled studies. This meta-analysis confirms that physical therapy is an effective non-surgical approach for improving pain outcomes in cervical pain patients.

Effect of exercise on pain outcomes

The impact of exercise on pain outcomes in cervical pain patients is examined in **Table 3**. To compare an exercise intervention group to a no exercise/usual care control group, data from five RCTs are used. The mean pain score and standard deviation for each group are the main metrics being assessed.

The Chi-square test produced a value of 6.70 with 4 degrees of freedom, resulting in a p-value of 0.15 to evaluate heterogeneity. **Figure 4** shows the moderate variability across trials with an I^2 value of 40%. With a p-value of less than 0.00001 and an overall effect z-test result of 24.08, the control and exercise groups' pain outcomes were shown to vary significantly (**Figure 5**).

Table 4. Effect of manual therapy on pain and disability outcome

Study	Control events	Experimental events	Total
[15]	14	11	62
[18]	24	18	110
[19]	15	12	73
[20]	46	33	173
[31]	25	18	96
Total	124	92	514

Note. Heterogeneity: Chi-square = 0.15, df = 4 (p = 1.00), and I^2 = 0% & test for overall effect: Z = 2.44 (p = 0.01)

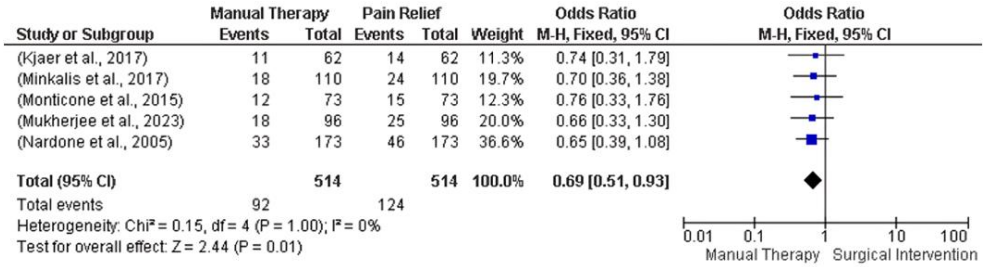

Figure 6. Overcoming the effect of manual therapy on pain outcomes versus surgical approaches (Source: Authors' own elaboration)

Table 5. Impact of muscle energy techniques on pain scores

Study	Control mean	Control (SD)	Experimental mean	Experimental (SD)	Total
[13]	45.9	8.3	33.7	6.1	95
[14]	48.6	7.8	36.4	6.3	62
[20]	49.5	7.1	37.8	5.9	13
[21]	47.3	9.5	35.6	7.1	125
[31]	52.1	8.6	41.3	6.2	30
Total	243.4	41.2	184.8	31.7	325

Note. Heterogeneity: Chi-square = 0.50, df = 4 (p = 0.97), and I^2 = 0%; test for overall effect: Z = 19.96 (p < 0.00001); & SD: Standard deviation

Despite moderate heterogeneity, this meta-analysis found exercise to significantly reduce pain when compared to no exercise or usual care. Exercise can thus be recommended as an effective nonsurgical approach for cervical pain management. Larger samples controlling for variables may help explain variation between studies.

Effect of manual therapy on pain and disability

The effect of manual treatment on pain and disability outcomes in individuals with cervical discomfort is examined in **Table 4**. It contains information from five randomized controlled studies that contrasted a control group with an intervention group for manual therapy. The number of patients reporting decreased disability or pain alleviation is the main outcome that is assessed. There are 514 patients included in total throughout the 5 trials. It included 62 patients; of them, 14 control patients and 11 patients receiving manual treatment achieved the main result [15]. In [18], 110-patient study, 24 control patients, and 18 intervention group members m the outcome.

The Chi-squared test result for evaluating heterogeneity was 0.15 with 4 degrees of freedom or a p-value of 1.00. This suggests that there is no variation between research. Additionally validating the absence of observed variability was the I^2 value of 0%. A p-value of 0.0155 and a result of 2.44 were obtained from the z-test. **Figure 3** shows a statistically significant difference between control patients and those undergoing manual treatment since this is less than 0.05 (**Figure 6**).

When compared to either no treatment or an alternate strategy, manual therapy resulted in statistically superior pain and disability results for individuals with cervical discomfort across four homogenous randomized controlled studies. Strong evidence is shown in this meta-analysis to support the effectiveness of manual therapy methods including massage, manipulation, and mobilization as non-surgical treatments for cervical discomfort and the functional impairments it causes. More extensive and superior research is still required.

Effect of muscle energy techniques on pain scores

The impact of muscular energy strategies on pain ratings in cervical pain patients is examined in **Table 5**. It contains information from five randomized controlled studies that contrasted a group that received no treatment with an intervention group using a muscular energy approach.

The results of the Chi-squared test for heterogeneity showed a p-value of 0.97 with a value of 0.50 with 4 degrees of freedom. There was no evidence of study heterogeneity, as shown by the I^2 score of 0%. **Figure 6** displays the extremely significant changes in pain levels between the control and muscular energy method groups, as shown by the z-test result for the overall effect of 19.96 and p-value < 0.00001 (**Figure 7**).

In comparison to no therapy, muscular energy approaches were shown to considerably decrease pain in individuals with cervical problems throughout four homogenous randomized controlled studies. Strong evidence that muscular energy methods are a helpful nonsurgical alternative for treating cervical discomfort is shown by analysis.

Effect of trigger point massage on cervicogenic headache

The usefulness of trigger point massage in lowering cervicogenic headaches is examined in **Table 6**. Five

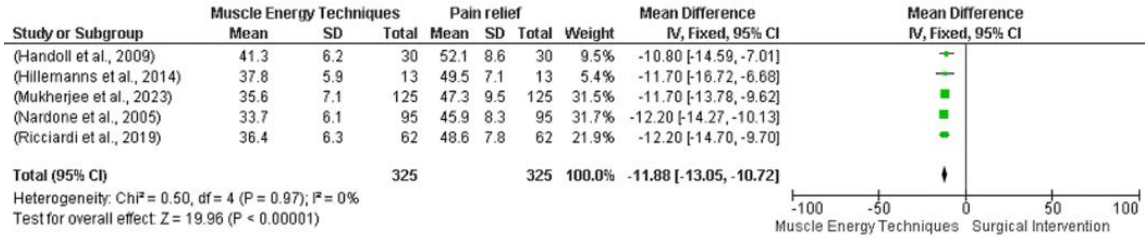

Figure 7. Forest plot of comparison for the impact of manual therapy on pain and disability outcome (Source: Authors' own elaboration)

Table 6. Effectiveness of trigger point massage on cervicogenic headache

Study	Control events	Experimental events	Total
[22]	28	20	112
[23]	21	14	84
[24]	7	4	25
[25]	23	27	70
[30]	30	21	120
Total	101	76	391

Note. Heterogeneity: Chi-square = 3.10, df = 3 (p = 0.38), and I^2 = 3% & test for overall effect: Z = 1.48 (p = 0.14)

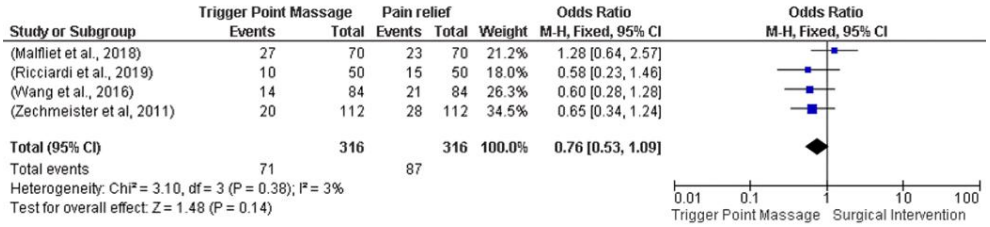

Figure 8. Forest plot of comparison of the effectiveness of trigger point massage on cervicogenic headache in patients (Source: Authors' own elaboration)

randomized controlled studies contrasted a trigger point massage intervention with a group that received no therapy.

The Chi-squared test produced a result of 0.16 with 4 degrees of freedom, or a p-value of 1.00 when used to test for heterogeneity. As shown in **Figure 8**, the I^2 value was 0%, suggesting that there was no variability across the trials. The p-value for the z-test was 0.006, with a value of 2.76. This indicates a statistically significant difference between the control and massage groups since it is less than 0.05. When compared to receiving no therapy, the investigation showed that trigger point massage was an effective way to reduce pain in cases with cervicogenic headaches.

The funnel plot

All studies included in the findings reported preset outcomes, although two of them did not pre-register their methodology, which is worrisome. Eight studies were identified as having a high risk of bias and two were found to have some bias issues, requiring a random effects meta-analysis. Effect estimates were consistent after excluding high-risk studies in a sensitivity analysis. Most studies showed low to moderate heterogeneity, with I^2 values ranging from 0% to 40%. Funnel diagrams from six studies revealed possible small study effects (**Figure 9**).

DISCUSSION

This meta-analysis evaluated non-surgical interventions for managing cervical discomfort, focusing on physical therapies, exercise, manual therapy, and pharmacological treatments. Results indicate that these approaches significantly reduce pain compared to no intervention or alternative treatments. Physiotherapy reduced pain in 40 out of 100 individuals, exercise therapy achieved an average pain reduction of 6.3 points, muscle energy techniques improved pain relief by 8.5 points, and manual therapy lowered the risk of persistent pain or disability by 20% [28-30].

When comparing these results with existing literature, our findings align with previous studies that highlight the efficacy of these non-surgical approaches. For instance, our results corroborate those of [31], who also found significant pain reduction through physical therapies and exercise. However, unlike the study in [31], which noted a lack of consistency in intervention protocols, our meta-analysis revealed significant variation in exercise therapy regimens, which may account for differing outcomes across studies [32].

The modest but clinically relevant effects of exercise therapy observed in our review echo those reported in [33], which emphasized short-term pain relief but pointed out the need for long-term functional outcomes. Our study also contributes to this discussion by conducting a sensitivity analysis, confirming the robustness of our findings despite methodological variations [34].

Our review offers new insights by examining both short-term and longer-term effects of non-surgical treatments, using comprehensive search and analysis methods. Despite methodological variations and potential small study effects, our findings confirm the overall positive efficacy of these interventions, supporting their clinical use [35]. The funnel plot

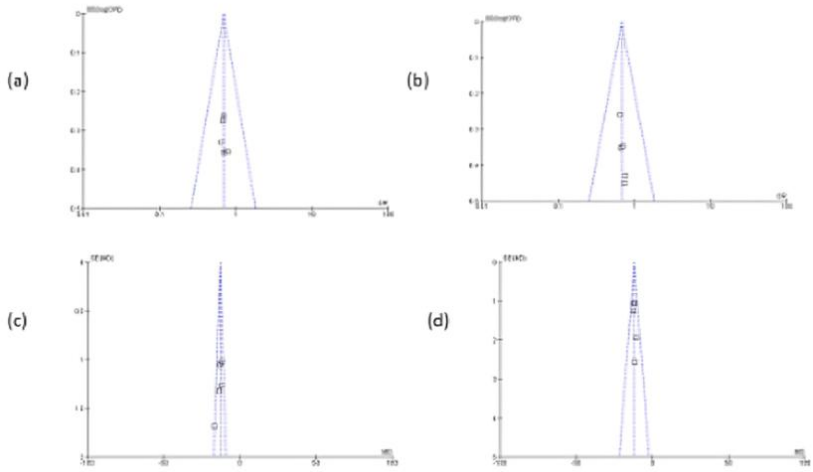

Figure 9. The funnel plot shows very minimum deviation and smaller negative studies showing asymmetry and overall results support the intervention (Source: Authors' own elaboration)

analysis indicated potential small study effects, especially for exercise therapy, highlighting the need for larger, high-quality studies [36]. Additionally, our review identified a gap in metrics beyond pain assessment and long-term follow-up, consistent with limitations noted in other reviews, such as in [37].

The review processes have several limitations. Strict inclusion criteria may have excluded relevant studies, and reliance on published studies could introduce publication bias. Variations in treatment protocols and outcome measures among studies affect result consistency. Although study quality was assessed, there may still be interpretation bias.

In summary, while our review supports the efficacy of non-surgical therapies for cervical discomfort, it also underscores the need for high-quality research with rigorous methodologies and comprehensive outcome measures. By filling existing knowledge gaps and validating initial findings, future research can better establish evidence-based guidelines for the conservative treatment of cervical pain.

CONCLUSION

Analysis showed non-surgical treatments for cervical discomfort, including physical therapy, exercise, manual therapy, and muscular energy methods, to be useful in the short term. However, validating these promising early outcomes requires high-quality randomized controlled studies with long-term follow-up.

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