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EXPLORING EFFICACIOUS INTERVENTIONS FOR CHRONIC LOW BACK PAIN: A REVIEW OF LITERATURE ON PHYSICAL THERAPY AND PHARMACOLOGICAL MANAGEMENT

Running Head: Physical Therapy and Pharmacological Interventions for Chronic Low back pain

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ABSTRACT

Background: Chronic low back pain (CLBP) often lasts for twelve weeks or longer despite the root cause of acute backache or the initial injury has been treated. It affects 70%-80% of persons at some point in their life. Work-related low back pain significantly impairs the productivity and well-being of workers across various fields, particularly those engaged in manual labor, prolonged sitting, or repetitive tasks.

Objective: To summarize the existing literature or evidence on various physical therapy and pharmacological interventions for chronic LBP treatment.

Methods: A detailed literature search was performed in August 2023 using PubMed, Cochrane Database of Systematic Reviews, AMED, CINAHL, Web of Science, and PEDro. Using specific keywords, studies addressing medication or physical therapy for CLBP management were sought. Titles and abstracts were independently screened by the authors, with potentially relevant full-text studies assessed for eligibility. Data on CLBP interventions were then extracted and narratively reviewed.

Conclusion: The review summarizes the key findings from the current research on chronic low back pain therapy, emphasizing the significance and efficacy of both physical therapies and pharmaceutical choices. This insight is critical for doctors and therapists in developing patient-centered, successful treatment programs, ultimately improving the quality of life for those suffering from chronic LBP.

Keywords: Low back pain; Physical therapy; Physiotherapy; Pharmacological treatment; CLBP

1. INTRODUCTION

Back pain stands as a significant source of disability worldwide. Estimates based on routinely collected data indicate that the incidence of LBP ranges from 0.024 to 7.0%, while its prevalence spans between 1.4 to 20.0% [1]. 25.7% of the US workers reported to have self-reported backache from past three months [2]. 52.4% of bankers reported having low back discomfort, according to a Pakistan-based survey [3]. CLBP is defined as pain that lasts for twelve weeks or longer despite the root cause of acute backache or the initial injury has been treated. CLBP affects 70%-80% of persons at some point in their life [4]. Work-related low back pain significantly impairs the productivity and well-being of workers across various fields, particularly those engaged in manual labor, prolonged sitting, or repetitive tasks. This pervasive issue not only leads to medical expenditures but also results in lost workdays and decreased quality of life, affecting both the individual's livelihood and the overall efficiency of the workforce [5-7].

The objective of this review of literature was to summarize the existing studies on various physical therapy and pharmacological interventions for managing the CLBP. Amidst the prevalence of CLBP significantly impacting global workforces, there's a pressing need for this review to synthesize and critically assess the efficacy of various physical and pharmacological interventions, facilitating informed clinical decisions and patient care strategies.

2. EVIDENCE ACQUISITION

2.1 Search Strategy

A comprehensive literature search was conducted in August 2023 across multiple databases. Data from PubMed, AMED, CINAHL, Web of Science, the Cochrane Database of Systematic Reviews and PEDro were searched to find papers that discussed the use of medication or physiotherapy to treat chronic low back pain.

2.2 Keyword search

The following keywords were used to search for relevant studies using the boolean AND, OR, etc. operators: "Chronic Low Back Pain", "Physical Therapy", "CLBP", "Pharmacological Interventions", Pharmacotherapy, "Exercise Therapy", "Low Back Pain Management", "Drug Therapy", "Interventional Strategies for CLBP", "CLBP Treatment", "Exercise Therapy", "Manual Therapy" and "Electrotherapy".

2.3 Selection criteria

2.3.1 Inclusion criteria

- Studies focused on adult population of age 18 years or above experiencing chronic low back pain.
- Studies published up to 2023.
- Studies examining non-surgical interventions for chronic low back pain including physical therapy, medications or pharmaceutical therapy or any combined treatment
- Articles written and published in English language

2.3.2 Exclusion criteria

- Types of studies including case reports, anecdotal reports, editorials and letters to editor.

- Studies focused exclusively on pediatric populations or populations with conditions not directly related to chronic low back pain (e.g., cancer, systemic diseases).
- Studies examining surgical interventions or alternative therapies without empirical evidence of their efficacy.
- Studies without clear outcome measures or those that rely solely on subjective patient reports without validated scales.

2.4 Studies selection and data extraction

Titles of the researches and abstracts were separately screened by the authors, and studies with possibly relevant complete text was considered for eligibility. Data on pharmaceutical and physical therapy interventions for CLBP were extracted and reviewed narratively in this article.

3. FINDINGS

3.1 Physical therapy management

Physiotherapy aims to improve function and prevent disability from deteriorating.

Guidelines for low back pain include avoiding bed rest and continuing with normal activity [8].

3.1.1 Exercise therapy

Exercise therapy has evolved into the 1stprimary treatment option for chronic backache and should be used on a regular basis [9]. Clinical practice guidelines are inconsistent in terms of the type of exercise plan required (yoga, tai chi, stretches, back schools, hydro-therapy exercises, and McKenzie exercise technique] and how it is provided [group exercise, individualised programmes, or guided home exercises) [10]. Back school (BS) comprises of group exercise activity and has been proved to be efficient through a number of research studies [11]. Pilates is a workout regimen that focuses on regulated movement, breathing, and stretching [14]. Electromyography feedback (EMG-FB) provides technology-supported exercise therapy (TSET) and have been developed to help LBP exercise treatment [15]. Table 1 shows the findings of several studies related to exercise therapy for low back pain.

Table 1: Exercise Therapy for Low back pain

Study type	Conclusion	References
RCT	Back school not only improves QoL and functionality in low back pain (LBP), but it also promotes mental health	Paolucci T et al. 2012 [12]
RCT	McKenzie extension exercise improved discomfort, pain, mobility, lordotic angle, and impairment better than ELDOA postures.	M Shamshad et al. 2022 [13]
Systematic Review	Pilates found to be a successful rehabilitation method that has produced in desired results such as discomfort and impairment reduction.	Byrnes K et al. 2018 [14]
Systematic Review	Technology-supported exercise therapy (TSET) decreased discomfort, impairment, and overall quality of life in those with LBP	Matheve T et al. 2017 [15]

3.1.2 Electrotherapy

Table 2 shows the findings of several studies related to electrotherapy for low back pain.

Table 2: Electrotherapy

Modality	Findings of studies	References
Heat therapy	The American College of Physicians (ACP) [16] endorses superficial heat treatment, citing a Cochrane analysis that discovered evidence of moderate quality for short-term pain relief with superficial heat vs oral placebo or dressing without heating [17]	Qaseem A et al. 2017 [16] French SD et al. 2006 [17]
Transcutaneous Electrical nerve	It enhances functionality when assessed within 6 weeks of therapy [18]	Wu L-C et al. 2018 [18]

stimulation (TENS)	Significant mean differences observed in severity of pain from prior to and after the treatment among individuals who received TENS for no more than 5 weeks [19].	Jauregui JJ et al. 2016 [19]
	In individuals with chronic LBP, TENS has been shown to be much more efficient than placebo TENS in enhancing static flexion endurance [20].	Kofotolis ND et al. 2008 [20]
Neuromuscular Electrical Stimulation (NMES)	NMES improves para-spinal muscular endurance while having a mixed effect on para-spinal muscle thickness [21].	Linzmeye et al. et al. 2022 [21]
Therapeutic Ultrasound	Meta-analysis of ten RCTs showed no high-quality proof that ultrasound modality reduces pain and improves standard of life quality in individuals suffering from non-specific CLBP [22].	Ebadi S et al. 2022 [22]
	Three trials (N = 102) found that both therapeutic and sham ultrasonography reduced pain intensity significantly [23-25].	Ebadi S et al 2011 Durmuş D et al. 2010 Ebadi S et al. 2012 [23-25].
Extracorporeal shock wave treatment	A comprehensive review study concluded that there was inadequate data to verify the efficacy of ESWT in the treatment of LBP [26].	Seco J et al. 2011 [26]
	A systematic review concluded that the use of ESWT in clients with CLBP results in substantial and	Yue L 2021 et al. [27]

	measurable reductions in pain at follow up of one month and disability at three months [27].	
Low-level laser treatment (LLLT)	In a systematic review, three trials [28-30] included exercise as a supplementary treatment strategy in both the treatment and control groups, whereas the remaining four did not [31-34], implying that LLLT is an effective means of relieving backache in individuals with NSCLBP.	[28-30] [31-34]
Infrared	Infrared treatment unit employed in a trial was shown to be beneficial in relieving CLBP with no adverse effects [35].	Gale GD et al. 2006 [35]
	A study of LLLT vs monochromatic infrared photo energy in chronic low back discomfort found no differences in reducing functional impairment, discomfort, and lumbar mobility in individuals with CLBP [36]	Ammar TARA et al. 2015 [36]
Transcranial direct stimulation (tDCS)	Just a few researches look at the usefulness of tDCS in the CLBP management, and these studies reveal no improvement in pain, functional ability, or a better QoL [37].	Alwardat M et al. 2020

3.1.3 Manual therapy

Table 3 shows the findings of several studies related to manual therapies for low back pain

Table 3: Manual Therapies for Low back pain

Manual Therapies	Findings	References
Manipulation versus	A systematic review of mobilisation & manipulation in the treatment of chronic	Coulter ID

Mobilization	backache discovered evidence of moderate quality, that mobilisation & manipulation reduced pain and enhanced activity [38].	et al. 2018
McKenzie Method of Mechanical Diagnosis and Therapy (MDT)	Medium to high quality of MDT suggests that it is beneficial than other methods of rehabilitation at reducing disability and pain, although this was dependent on the sort of therapy employed in contrast to the MDT [39].	Lam OT et al. 2018 [39]
Spinal Stabilization versus other Manual Therapies	Manual therapy & SSE had the same impact on QoL, but manual therapy is more beneficial on pain reduction and functional metrics [40].	Ulger O et al. 2017 [40]
Deep friction massage (DFM) versus Positional Release technique (PRT)	DFM and PRT were equally beneficial in lowering lumbar pain, disability, and enhancing lumbar mobility in low back pain [41].	Ammara U et al. 2023 [41]
Neuromuscular inhibition versus Mulligan mobilisation with movement (MWM)	Integrated neuromuscular inhibition approach was superior than Mulligan mobilization with movement for alleviating pain and functional impairment in non-specific backache [42].	Chitale Jr N et al. 2022 [42]

3.2 Pharmacological Interventions

Pharmacologic treatments are fundamental for management of lower back pain. Pharmacological treatment is advised when first-line therapy fails. Choosing the best medication for LBP continues to be a difficult task for doctors [43, 44].

3.2.1 Acetaminophen and Non-steroidal anti-inflammatory medications (NSAIDs)

NSAIDs and acetaminophen have been demonstrated to be beneficial for short-term treatment [45-47]. Because of the likelihood of urinary, cardiovascular, and gastric systemic complications, the use of NSAIDs is discouraged, and only the smallest effective dose for the shortest period is suggested [48, 49]. Table 4 shows the findings of several studies related to effects of acetaminophen and NSAIDs for Low back pain.

Table 4: Acetaminophen and Non-steroidal anti-inflammatory medications (NSAIDs)

Sr. No	Findings	References
1.	Acetaminophen is somewhat less effective than NSAIDs in the treatment of pain in persistent lower back pain [46].	Chou R et al. 2014 [46]
2.	Both non-selective and COX-2 selective NSAIDs have been shown to be more effective than placebo, with no obvious difference in efficiency [47, 48].	Roelofs PD et al. 2008 Van Tulder M et al. 2006 [47, 48].
3.	There is insufficient proof suggesting NSAIDs are more efficacious than sham treatment [4 RCTs; n=1,020] [50-53].	[50-53]
4.	Five trials examined the effects of COX-2 NSAIDs on CNLBP to placebo, revealing a statistically significant benefit for COX-2 NSAIDs [51-55].	[51-55]
5.	Two studies evaluated the impacts of COX-2 NSAIDs with standard NSAIDs and discovered no significantly different results [56, 57].	Chrubasik S et al. 2003 Zerbini C et al. 2005 [56, 57]

3.2.2 Opioid

Some studies compared the effects of opioids against placebo and other medications. The results of seven studies [58-64] were combined in a meta-analysis. Webster [63] and Vorsanger [64] used numerous intervention arms. There is little evidence [4 RCTs; n=1,258] that tramadol are more effective than sham or placebo in enhancing functionality. One research [65] evaluated naproxen, another analgesic with opioids. Tramadol and other stronger opioids should be used with caution and only for severe enough incapacitating pain that cannot be managed using that medications. These drugs ought to be administered in a time-limited regimen, with analgesic efficacy, enhanced activity, adverse effects, and unusual behaviours being monitored [49]. Table 5 shows the findings of several studies related to effects of opioids for low back pain.

Table 5: Opioids

Sr. No	Findings	References
1.	There is limited literature [7 RCTs; n=2,350] indicating individuals receiving opioids experienced higher pain alleviation than people who got a sham or placebo treatment. [58-64]	[58-64]
2.	There is one RCT [n = 23] with extremely low quality data showing There is not a disparity in pain severity or performance between opioid and other medicine [65].	Jamison RN et al. 1998 [65]

3.2.3 Anti-depressant

TCAs function primarily through inhibiting serotonin, antagonising NMDA, inhibiting norepinephrine reuptake and blocking Na channels. Serotonin norepinephrine reuptake inhibitors (SNRIs) are another type of medication used to treat chronic backache. Venlafaxine and duloxetine have been shown to be successful in RCTs, with the former being more well tolerated. SNRIs promote analgesia by reducing nor-epinephrine and serotonin reuptake, which is necessary for the suppression of pain. Mouth dryness, self-limited dizziness, vomiting, sleeplessness and headaches are the most prevalent adverse effects [46] . Table 6 shows the findings of several studies related to effects of anti-depressants for low back pain.

Table 6: Anti-depressants

Sr.	Findings	References

No		
1.	Tricyclic antidepressants (TCAs) have been demonstrated to be effective in the treatment of lower backache [45, 46, 49].	[45, 46, 49]
2.	Three trials comparing anti-depressants with sham/placebo revealed no changes in pain intensity [66-68], but Atkinson's et al. and two further investigations demonstrated a higher alleviation in pain by using antidepressants [66, 69, 70].	[66, 69, 70]
3.	Functional status was used as an outcome measure in one research. One low-quality RCT with 92 participants found no disparity in level of functioning with antidepressant use versus placebo in people with LBP [67].	Dickens C et al. 2000 [67]

3.2.4 Muscle relaxants and Antiepileptics

Lower backache has also been shown to be alleviated with skeletal muscle relaxants. The principal related adverse effects of relaxant usage include CNS drowsiness and increased risk of falling [46]. Because of its conversion to meprobamate, a sedating and potentially addictive barbiturate, carisoprodol should be used with care [49].

Antiepileptics are also used in the pharmacologic management of lower backache. Although topiramate helps people lose weight, it also causes drowsiness, dizziness, and a rare kidney condition called nephrolithiasis. [71]. Table 7 shows the findings of several studies related to effects of muscle relaxants and antiepileptic for low back pain.

Table 7: Muscle relaxants and Antiepileptic

Sr. No	Findings	References
1.	Trials over a short period of time (two weeks) showed analgesia, superior to placebo, but no clear distinction between distinct muscle relaxants [46, 48].	Chou R et al. 2014 Van Tulder M et al. 2006 [46, 48]

2.	Gabapentin has been proven to be analgesic in the treatment of chronic lumbar radiculopathy [49].	Chou R 2007 [49]
3.	One low-quality RCT with 92 participants found no disparity in level of functioning with antidepressant use versus placebo in people with LBP [67].	Dickens C et al. 2000 [67]
4.	Comparing the antiepileptic group to the placebo group, there were statistically significant differences in terms of pain alleviation and overall quality of life (all P values were less than 0.05) [40].	Ulger O et al. 2017 [40]

3.2.5 Other drugs

Nerve growth factor inhibitors, Cannabis, botulinum toxin, calcitonin, antibiotics, and melatonin, ketamine and novel opioids have studied in studies for CLBP. Several of these therapies are still being researched, and there is conflicting information regarding their efficacy. A review that was published in 2020 found no proof that amoxicillin medication may help with modic alterations [72-75].

4. View points

The literature on chronic LBP management underscores the importance of personalized, multifaceted approaches, utilizing both pharmacological and physical therapy interventions. The literature demonstrates that physical therapy plays a vital role in managing CLBP, primarily through exercises, electrotherapy, and manual therapy. Exercise therapy, particularly when combining strengthening, stretching, or aerobic exercises, is highlighted as a 1st line treatment and preventative measure for lower backache, with evidence supporting its effectiveness in alleviating pain and enhancing functionality. Various forms of exercise programs, including yoga, Pilates, tai chi, and McKenzie exercises, have proven effective, although inconsistencies remain in guidelines regarding the optimal type and delivery mode. Electrotherapy, encompassing low-level laser therapy, TENS, NMES, therapeutic ultrasound, ESWT, and infrared therapy, provides varying levels of pain relief, with each modality presenting different efficacy levels and treatment durations. Nonetheless, other treatments like therapeutic ultrasound and extracorporeal shock wave treatment showed inconclusive or insufficient evidence of

effectiveness, indicating the need for further research and consideration in clinical application. Manual therapy, including the McKenzie Method, mobilization, and manipulation, offers moderate to high-quality evidence of efficacy in alleviating pain and disability, with effectiveness often dependent on the specific comparative therapies. Given the diverse range of physical therapy interventions available, a personalized approach, considering the individual patient's condition, preferences, and response to treatment, is crucial for optimizing therapeutic outcomes and improving QoL.

NSAIDs, tricyclic antidepressants (TCAs), certain antiepileptics, serotonin norepinephrine reuptake inhibitors (SNRIs), opioids and muscle relaxants all provide pain relief, according to the reviewed literature on different pharmacological therapies for chronic pain in the low back. However, their efficacy varies, and each comes with distinct side effects. NSAIDs are highlighted for short-term relief, with COX-2 selective NSAIDs showing statistically significant effects. Opioids should be considered judiciously due to their risk profile. TCAs and SNRIs have established efficacy with manageable side effects, providing another valuable option. Muscle relaxants are effective but are associated with CNS sedation. Antiepileptics like topiramate show promise with additional benefits like weight loss, but side effects need careful consideration. Hence, personalized, cautious, and informed prescribing, considering the individual patient's pain intensity, overall health, and risk factors, is imperative for optimal therapeutic outcomes.

Limitations: The inherent inconsistency in the techniques and outcome measures throughout the analyzed studies are one of the key limitations of this review, making direct comparisons and meta-analyses difficult. The review also fails to adequately address the included research' possible biases or limitations, which may affect the reliability and generalizability of the conclusions reported.

Recommendation: Future research should delve deeper into the dose-response relationships of both pharmacological and physical interventions to delineate optimal dosages and treatment durations. Investigate the effectiveness of emerging technologies in enhancing physical therapy interventions, including virtual reality, wearable devices, and tele-rehabilitation platforms. Foster multidisciplinary collaborations involving physicians, physical therapists, psychologists, and other healthcare professionals to offer holistic and integrated care for patients of chronic lower backache.

5. Conclusion

The review summarizes the key findings from the researches on chronic LBP therapies, emphasizing the significance and efficacy of both physical therapies and pharmaceutical choices. This insight is critical for doctors and therapists in developing patient-centered, successful treatment programs, ultimately improving the quality of life for those suffering from CLBP.

Informed Consent and Human & Animal Rights: None of the authors have conducted any new experiments using human or animal subjects for this literature review; instead, it reviews evidence that has already been published.

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