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RESEARCH ARTICLE

**CONSEQUENCES OF NON-INVASIVE THERAPIES ON
LOW BACK PAIN: A NARRATIVE REVIEW**

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Abstract

Background: Low back pain is a global public health concern, causing major morbidity, disability, and costs. It is the third largest health expenditure after diabetes and ischemic heart disease, with world wide impact. Previous studies reported that most cases unnecessary invasive treatments carry extra expenses of money and are hazardous for patients who suffer from lower back pain. The study aimed to find out the consequences of various non-invasive therapeutic approaches for nonspecific low back pain.

Methods: A comprehensive review of relevant article and existing literature was conducted using prominent scientific databases and research search engine, including PubMed, Cochrane Library, Google scholar, Google advanced search covering the period from 2000 to 2024. All appropriate publications were systematically reviewed and presented.

Results: Based on past information, it has been found that the status of low back pain varies due to factors like socio-economic conditions, nature of activity, habits, etc. Different non-invasive therapies i.e. exercise therapy, massage therapy, cognitive behavioral therapy, educational interventions, tai-chi, pilates, yoga, and different other complementary and alternative treatments, helped to reduce the volume and intensity of pain and develop the quality of life without any side effect.

Conclusion: Findings of the present study suggested that more multidimensional and larger studies are required to investigate the accurate epidemiological structure of low back pain and acquainted with new non-invasive therapies to reduce low back pain.

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Introduction:-

Low back pain is a common condition characterized by pain or discomfort in the lower part of the spine. [1–3] The intensity of low back pain can range from mild to severe and may be acute or chronic, lasting from a few days to three months or longer. [4–5] Globally, 619 million people suffered from low back pain (LBP) in 2020; this number is projected to rise to 843 million by 2050, primarily due to population growth and aging. [6] The causes of low back pain are diverse and may include muscle strain, poor posture, overuse or injury, degenerative conditions such as osteoarthritis and degenerative disc disease, herniated or bulging discs, spinal stenosis, sciatica, and various underlying medical conditions. [7–11]

Depending on the cause, low back pain (LBP) can be categorized into different groups: 80% to 90% of cases are due to degenerative disc or joint disease, vertebral fractures, or deformities; 5% to 15% are nerve-related, such as herniated discs or spinal stenosis; 1% to 2% result from neoplastic disease, infections, or inflammatory conditions; 1% to 2% are referred visceral pain cases, such as gastrointestinal, renal, or abdominal aortic aneurysms; and 2% to 4% are due to other causes such as fibromyalgia, somatoform disorders, or malingering. [12] The underlying cause, severity of symptoms, and patient characteristics influence the treatment approach for low back pain. Treatment modalities may include rest, activity modification, over-the-counter or prescription pain medications, physical therapy, chiropractic care, acupuncture, corticosteroid injections, and, in some cases, surgery. [13] Low back pain can also be prevented or managed through lifestyle modifications, such as maintaining a healthy weight, practicing good posture, and engaging in regular exercise. [14]

Non-pharmacological management focuses on addressing the root cause of the problem rather than merely masking symptoms. It takes into account the physical, psychological, and social aspects of pain, resulting in more comprehensive care. Many pharmacological treatments for low back pain—such as opioids or nonsteroidal anti-inflammatory drugs (NSAIDs)—carry risks of side effects and potential dependency. In contrast, non-pharmacological interventions offer alternatives with minimal or no side effects. While medications may provide temporary relief, non-pharmacological approaches often target the underlying causes of low back pain, leading to more sustainable, long-term pain management strategies. Additionally, these interventions empower individuals to take an active role in managing their condition.

Cost Effectiveness:

Most cases of back pain are caused by mechanical problems—structural disturbances rather than a single identifiable factor. [15] The treatment of low back pain has a significant impact on patients' lives. In the United States, low back pain accounts for over \$100 billion in expenses, with two-thirds of these costs resulting from lost wages and reduced productivity. [16] The cost of invasive treatments varies significantly. A stepwise approach to managing chronic low back pain—beginning with non-invasive treatments—can help reduce the overall economic burden. [17] Non-pharmacological and interdisciplinary rehabilitation methods such as exercise, acupuncture, spinal manipulation, and cognitive behavioral therapy have been shown to provide relief from both acute and chronic low back pain. [18]

Research has shown that combining non-invasive methods with invasive treatments can effectively alleviate back pain. Through X-ray diagnostics, physicians can visualize internal structures without the need for surgery. Today, imaging technologies such as X-rays and other scans offer a non-invasive way to examine internal organs and diagnose various conditions. [19] While all medical procedures have benefits, they also carry risks and potential side effects. In light of this, the present study focused on the outcomes of non-invasive therapies for treating low back pain.

Methodology:-**Acquisition of Evidence:**

We collected scientific evidence through PubMed, Cochrane Library, Google Scholar and Google Advance Search and critically analyzed the relevant articles according to the nature of this study. The study utilized the information from the articles published in aforementioned databases between 2000 and 2024.

Inclusion and Exclusion Criteria:

The articles related to non-medication therapies on low back pain were included in this study whereas articles that were purely medication, surgery, or any break in the skin for treating low back pain were excluded from the study.

Selection Procedure of Review Articles:

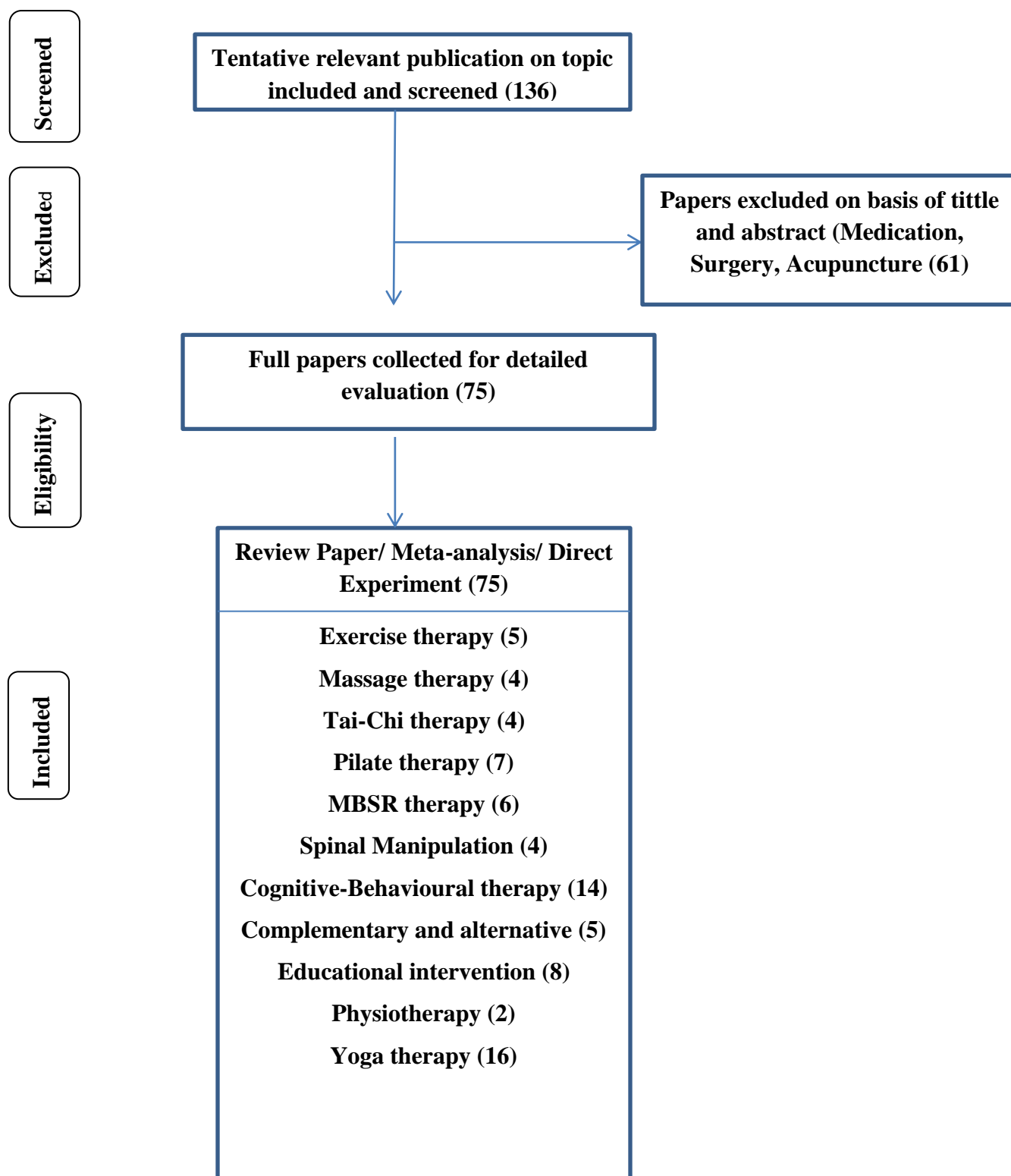


Figure-1: Flow diagram of systematic review inclusion or exclusion

Observation and findings:

Exercise Therapy:

Exercise therapy is the movement of body parts to strengthen of muscles, bones, and joints and maintain proper alignment of the body. It is mainly composed of physical activities designed and prescribed for the restoration of normal musculoskeletal function and to reduce pain. It can be planned as per the nature and intensity of the pain. Research evidence suggests that exercise therapy is highly effective for acute low back pain, similar to other conservative treatments. Research indicates that not only within the healthcare population the exercise therapy is also very effective in reducing pain and enhancing functional ability among adults with chronic low back pain.[20]Economic expenditure due to low back very glares.

Approximately 1,50,000 insurance claims were submitted for this type of treatment in USA. (Early physical therapy benefits May 23, 2018) Exercise increases core muscular strength, which supports the lumbar spine, improves the flexibility to increase the range of motion and assist the patient's functional movement in a better way. Aerobic exercise increases the blood flow and supply of nutrients to the soft tissues in the back, improving the healing process and reducing stiffness of the back. [21]Primary care by physicians is better for chronic or recurrent low back pain and it is more cost-effective than other treatments. [22]Too much opioid addiction is harmful to health concerning physical therapy of adults with low back pain. (Study suggests Physical Therapy, Jun 25, 2018). Physical therapy is the most effective treatment for lumbar degenerative disc disease, which is a common cause of low back pain. Physical therapy works on low back pain and avoids unnecessary spinal surgery. [23]

Pilates Therapy:

For patients who are cared for with the back school method, the same Pilates method removes low back pain from patients. [24]The Pilates method improves specific core stability of muscle and joints which improves functional movements of chronic low back pain along with increased level of health, sports functioning, flexibility, and proprioception.[25]Patient carried on Pilates exercise over 12 months effectively improve the low back pain. [26]Most of the studies treat non-specific low back pain through Pilates and yoga therapies but need to set specific exercises and promote recovery of back pain. [27]Pilates base exercises high to minimal intervention of pain relief because of low-quality assessment, heterogeneity in the population, and difficulty interpreting the actual effect of Pilates on low back pain.[28]Pilates yielded better therapeutic outcomes than usual care but clinical effectiveness is inconvenient, suggesting further study. [29]

Massage Therapy:-

Massage is stimulation to elevate the circulation of blood and nerve impulses to the cells. It helps to strengthen the muscles and skin tissue while relaxing the stressed areas of the body. Though, it is an ancient technique of therapy but effective without any side effects. Massage therapy is a promising treatment for chronic low-back pain for patients who may have multiple pathologies. [30]A survey (2001) of American Massage Therapy Association reported that the number of adults receiving massage therapy more than doubled since 1997. Most healthcare providers consider massage therapy as a most effective aid for the treatment of lower back pain.[31]Regular usual care with different types of massages provides relief from chronic low-back pain for a long time. [32]Massage detoxifies, or reduces pain from "deep tissue". Massage therapy helps relax tense tissues, and serving as a beneficial treatment for musculoskeletal system. [33] Outcomes of a study had 10 massage sessions with licensed massage therapists over 24 weeks and it positively impacted pain, disability, and health-related quality of life for patients with chronic low back pain. [34] In real-world massage therapy, it is an effective treatment for chronic low back pain. [35]

Spinal manipulation therapy:

Spinal manipulative therapy gives short-term benefits in case of acute low back pain. There is insufficient research evidence regarding the effect of this therapy on low back pain. [36]Knowledge about spinal manipulation therapy may relieve low back pain. Immediate pain is reduced more by spinal manipulative therapy than soft tissue massage but follow-up conditions in both massage and spinal manipulative therapy result in substantial improvement. [37]The effectiveness of spinal manipulative therapy is doubtful even more harmful than other exercise and back school therapy. [38]

Tai Chi:

The traditional Tai Chi Quan has been modified to Tai Chi after incorporating key principles. It is an ancient Chinese form of exercise created as a fighting art. The smooth and flowing movements of Tai chi possess healing properties and promote wellness. Unlike high-impact aerobics, tai chi avoids jarring motions, making it gentle on the spine. Its slow and deliberate movements create a soothing, low-impact exercise experience. Ten-week tai chi program for long-term low back pain is effective power healing. [39-41] Tai chis have better efficacy than certain other sports in the treatment of non-specific chronic LBP and provide immediate relief. [42]

Mindfulness Based Stress Reduction (MBSR):

Mindfulness-Based Stress Reduction therapeutic approach utilizes mindfulness techniques to help individuals manage pain and various health conditions. It is more effective than usual care and greater improvement in back pain. [43,44] Mindfulness-based Stress Reduction Program leads to increased cortisol (evening) levels that help reduce chronic low back pain. [45] Psychological stress at workplace and previous history of mild low back pain (LBP) are factors associated with the presence of moderate low back pain. For the patients with chronic low-back pain the mindfulness based stress reduction may provide some immediate relief. Twenty-six weeks MBSR program is an effective treatment option for patients with chronic low back pain. [43, 44] Mindfulness-based stress reduction may reduce the short-term pain intensity and increase physical functioning. [46]

Cognitive Behavioural Therapy (CBT):

Cognitive behavioural therapy is a psycho-social intervention that aims to improve cognition processes and behaviour. Cognitive behavioural therapy helps individuals identify and challenge negative thought patterns and behaviors, develop emotional regulation, and cultivate coping strategies to tackle problems effectively. Any physical disorder disbursed to mental health and vice versa. In the psychological aspect, cognition and behavioural model therapy are useful treat musculoskeletal disorders. Operant therapy was found effective for short-term pain relief. No significant differences were found for pain relief when operant therapy was compared to cognitive therapy or a combined behavioural treatment. [47] Behavioural therapy is important to the management of CLBP management and interventions are applied in practice.

Treatments for chronic low back pain (CLBP) focus on changing behaviors, thought patterns, or physical responses to manage pain effectively. [48] Cognitive behavioural approach incorporates different techniques like pacing activities, supportive partner involvement, and positive reinforcement, goal-setting for gradual progress, cognitive reframing, coping skills training, and relaxation techniques. This process of treatment for CLBP administered either individually or in small groups over 8-12 sessions. [49] Cognitive behavioural therapy intervention can be successful and probably cost-effective in those with sub-acute and chronic low back pain. [50] CBT is a feasible treatment for cognitively intact, older persons with CLBP. [51] A recent Cochrane review found that CBT had small but significant effects on pain and disability, and moderate benefits for mood and catastrophizing, lasting up to 6-12 months after treatment, compared to usual care or waitlist controls. [52] CBT has been tailored to and found beneficial for, special populations with chronic pain, including children and older adults. [53,54] CBT as a psychotherapy included cognitive restructuring, relaxation and daily home works and found that it is effective to reduce the different physical pain senses of female Iranian patients with NSCLBP. [55] The combined treatment procedure provided long term significant improvements in disability, emotional distress, self-efficacy, and catastrophizing. [56] This supplement provides stakeholders with a thorough understanding of non-surgical CLBP management options, enabling informed choices through expert evaluation. [57] CB interventions yield long-term improvements in pain, disability and quality of life in comparison to no treatment and other guideline-based active treatments for patients with LBP of any duration and of any age. [58] Group CBT is a resource-efficient alternative which has been received by the management of CLBP. [59]

Complementary and Alternative treatments:

Complementary and Alternative treatments are the forms of treatment that are used in addition to (complementary) or instead of (alternative) standard treatments. These treatments generally are considered indirect medical approaches. The benefit of Complementary and Alternative (CAM) treatments was mostly evident immediately or shortly after the end of the treatment for Back Pain and then faded with time. [60] CAM therapies have little evidence for the most beneficial CAM remedies that target common neurological disorders. [61] Research suggests that prenatal healthcare providers and pregnant women often consider complementary and alternative medicine (CAM) for pregnancy-related low back pain. [62] Within CAM, neuro-reflex therapy shows promise for chronic non-specific LBP. Additionally, spinal manipulation has been found effective, comparable to conventional

therapies. [63] A study reported after analysis of 20 studies of acupuncture and/or spinal manipulative therapy as a CAM therapy integrative care that CAM therapy was clinically effective for the management of LBP. The conventional medical care or exercise therapy combined with spinal manipulative therapy, exercise therapy, and acupuncture appears to be a promising approach to the treatment of chronic low back pain. [64]

Educational interventions:

Educational interventions are such procedures that provide the support to acquire the skills in cognitive, behavioural and social aspects to cope with physical and mental distortion taught by the educational system. Its implication depends upon the nature of the learners. For patients with high stress levels healthcare providers should incorporate information, cooperation, and timely suggestions into their clinical recommendations. [65] The educational workshop is required for the patients to bring a significant and favourable change in beliefs and attitudes towards low back pain. Practitioner knowledge can be changed successfully through evidence-based information. [66] The back school program showed significant benefits in overall health status and reduced medication use compared to general educational interventions.

It had no impact on pain management, functional ability, anxiety, and depression. [67] The combined effect of physiotherapy and educational programmes produced a symptomatic and functional change in the moderately disabled patients with chronic low back pain. [68] A study indicates the unsustainable effects of an educational booklet which can provide small benefits for a short span of time in the treatment of chronic non-specific low back pain. [69] The effectiveness of exercise without educational interventions in the prevention of LBP may not get the expected results. [70] For patients with or sub-acute and chronic LBP, Individual patient education is an effective programme. [71] There was moderate evidence supporting the hypothesis that Neurophysiological Pain Education (NPE) has a small to moderate effect on pain and low evidence of a small to moderate effect on disability immediately after the intervention. The 3 month follow-up study showed that NPE had a small to moderate effect on reducing pain and disability in patients with CLBP. [72]

Physiotherapy:

Physiotherapy is a commonly accepted treatment for low back pain that influences patients' attitudes, beliefs, and self-management skills. [73] Combining physiotherapy with educational therapy leads to significant improvement in symptoms and functional outcomes in patients with moderate low back pain.

Table 1. Low Back Pain and Non-Invasive Therapy Studies

Types of Back pain	Non-invasive therapies	Stages of Pain	References
Non-specific low back pain	Exercise therapy, Pilates, Tai-chi, Yoga, Qigong therapy, Cognitive Behavioural therapy	Chronic	[25,39,42,58,74,75,76,77]
Degenerated intervertebral disc	Self-Education therapy, Yoga therapy	Chronic	[78]
Discogenic low back pain	Physiotherapy	Chronic	[79]
Lumbar spondylitis	Yoga Therapy	Chronic	[80]
Herniated disc	Traction Therapy, Spinal Manipulation therapy, yoga therapy	Chronic	[81,82]
Neuropathic pain	Massage therapy	Chronic	[83, 84]
Sciatica pain	Massage therapy, Physiotherapy, Yoga therapy	Sub-acute, Chronic	[85-87]
Spondyloarthropathies	MBSR therapy, Tai-chi Therapy, Yoga therapy	Chronic	[88,89]
Muscular back pain	Tai-chi Therapy, Yoga therapy	Sub-acute, Chronic	[90,91]
Pelvic and abdominal organ related back pain	Yoga therapy	Sub-acute, Chronic	[92]

Yoga Therapy:

In individuals with nonspecific chronic back pain Yoga is more effective in reducing pain and enhancing health-related quality of life compared to conventional therapeutic exercises or self-care books. [91] Yoga may alleviate somatization symptoms and improve mental health outcomes, with reduced anxiety, depression, anger, and fatigue, and also enhancing spinal flexibility. [93] The practice of yoga could reduce pro-inflammatory cytokines

(biochemical makers of pain) and increase anti-inflammatory cytokines in industrial workers. Yoga may be an efficacious adjunctive treatment for Chronic Low Back Patients. Yoga therapy, as a multimodal treatment, can reduce muscular weakness, correct poor posture, and address inadequate flexibility, thereby improving biomechanical imbalances that contribute to pain.[94]Kundalini yoga or strength training at least twice in a week, can create a significant reduction in sickness, absenteeism and low back pain.[76]Yoga is as effective as physical therapy in treating lower back pain, improving function, and reducing pain medication use. [95]Yoga classes are more effective than a self-care book, in improving function and reducing symptoms due to chronic low back pain, with long lasting effect. [96]

Discussions of findings:-

Clinical research should clearly define sub-grouping of chronic low back pain but still be difficult to categorize of treatment. [97] Treatment of low back pain in the current trend is simple first-line care with follow-up, with more emphasis on non-pharmacological treatment and against surgery, injection, and denervation procedures.[98]Cognitive intervention and exercises are better than surgical treatment in long-term effects. [99]To treat chronic non-specific low back pain it required non-invasive intervention.[100] [101] found that most of the patients with conditions of acute or sub-acute low back pain improve through superficial heat therapy, massage, acupuncture, and spinal manipulation.

Clinicians should initially suggest treatment along with exercise, multidisciplinary rehabilitation, tai-chi, yoga, physiotherapy, and cognitive therapy. If patients fail to improve non-pharmacological therapy then should referred for surgery and drug line-up therapies.[102]Proper diagnosis with several treatment options combined with physical therapy, psychological therapy, and medication may create a significant effect in reducing low back pain. Exercise programs confer longer benefits to LBP, unlike the passive treatment of manual therapy which includes cognitive behavior therapy, educational approach, self-manage, and psychological thoughts. [103,104]To get initially positive results need to put on-invasive therapies for the treatment of degenerative disc diseases. It is necessary for insurance policies regarding the treatment of low back pain but policy on treatment varied one to another. Policy giver emphasis more on physical therapy and occupational therapy rather than physiotherapy, drug therapy, acupuncture therapy, and psychological therapy. [105]A specific number of acupuncture sessions had a major impact on low back pain and lowered the hazard rate of lumber surgery in all income groups in Korea.[106]

The efficacy of motorized traction ultrasound therapy and low laser therapy is proven fact to reduce low back pain intensity and functional disability. Non-invasive therapy induces flexibility, strength, endurance training, weight lifting, hydrotherapy, physiotherapy, and spinal manipulation to reduce low back pain at least 2 years of practice at age 40-60 years people. [107] Overwhelming first-line medical therapies for low back pain should considered prevention line work participation, education, self-management, exercise, and psychological balance that are cost-effective in part of the world. [108] Digital care management by software applications, consisting of sensor guide exercise therapy, education, cognitive behavioral therapy, team, and individual coaching improved low back pain patient's functional activity.[109]Neuro-modulation treatment is safe and without side effects, a less invasive reversible technique to receive back pain when other non-pharmacological treatments have failed. It also proved that after taking Neuro-modulation patients frequently avoid surgery and take opioids. [110]

Conclusions:-

Lower back pain significantly impairs work efficiency and incurs substantial treatment costs. Previous studies have shown that it reduces overall quality of life. Our study found that the prevalence of lower back pain varies globally due to factors such as socio-economic conditions, occupation, habits, and more. Various non-invasive therapies, including exercise, massage, spinal manipulation, mindfulness-based stress reduction, cognitive behavioral therapy, and complementary treatments like tai-chi and yoga, have been effective in reducing pain intensity and improving quality of life without adverse effects. A systematic approach by governments, healthcare providers, and individuals may help prevent and treat low back pain across all age groups. Based on our findings, we conclude that further research is needed to better understand the epidemiology of low back pain and to explore the potential benefits of non-invasive therapies.

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None

Author contributions:

Prasenjit Kapas: Literature search and manuscript writing.

ArumayJana: Conception of the study, design and literature search.

AsishPaul: Supervision and final approval.

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