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A Literature Review on High Intensity Laser Therapy in Patients with Chronic Low Back Pain

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Abstract: ***Purpose: To review the high intensity laser therapy treated patients with chronic low back pain. Search Method: Articles were selected from PubMed, Google scholar, Pedro, Research gate, Science direct by using the key words. Selection Criteria: Includes articles focusing on patients treated with high intensity laser therapy for chronic low back pain. Results: In these eight articles, high intensity laser therapy reduces the pain, disability, improves stability, balanced posture in patients with chronic low back pain. Conclusion: The study concluded that high intensity laser therapy reduces the pain, disability, and improve balance posture in patients with chronic low back pain.***

Keywords: chronic low back pain, high intensity laser therapy, disability, posture, intensity

1. Introduction

Low Back pain is a common condition affecting many people. The estimation between 5.0 - 10.0% develop chronic low back pain (1) . Low back pain is known as any pain, muscle tension, stiffness localized below costal margin and above the inferior gluteal fold and may or may not be radiate through leg.10 - 20% patients experience chronic low back pain more than 12 weeks. Chronic low back pain include symptoms related factors like back pain intensity, life style factors like low level physical activity, psychological factors like depressive symptoms, fear avoidance beliefs and social factors. (2)

Prevalence of chronic low back pain was 4.2% in population between 24 - 39 years, 19.6% in population between 20 - 59 years from different places according to cross sectional study. It is due to aging population, higher obesity rates. (3)

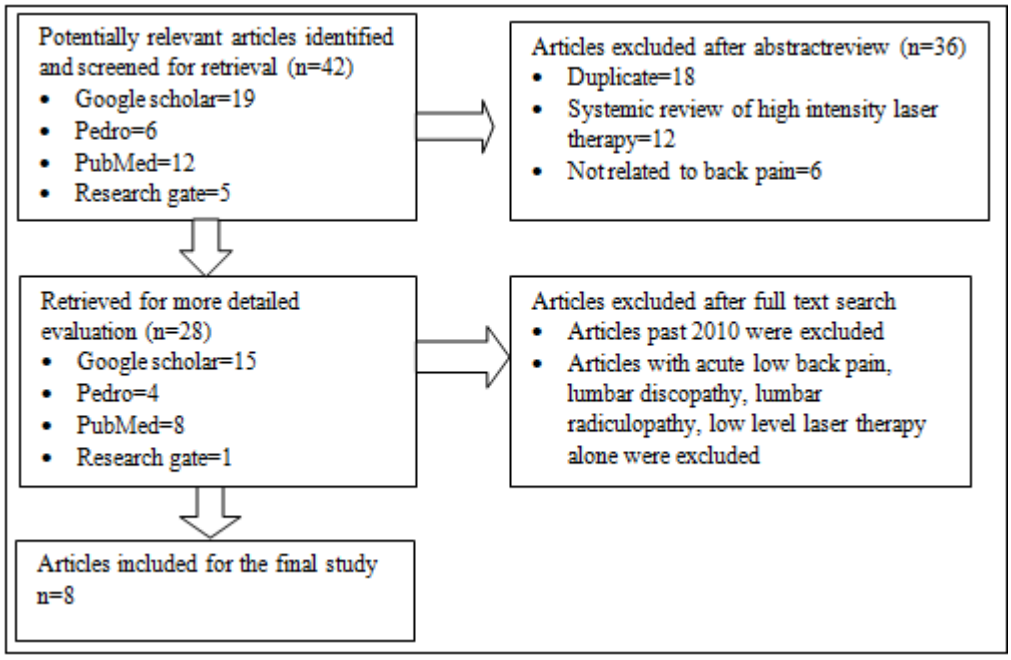
Risk factors for Low back pain due to heavy physical work, lifting, pulling, pushing, and repetitive work, static postures and vibrations and other factors like psychological and include stress, anxiety, depression, cognitive dysfunction, distress. The common presents of low back pain is impaired spinal movements. (4)

High intensity laser therapy (Light amplification by stimulated emission of radiation) is a device to amplify the electron spin rates by passing photon energy through particular medium to produce single directional laser beam having different wavelength than original light beam. The action is based on tissue stimulation, it occurs at the level of cell, vascular structure, interstitial tissue and immune system. Laser has direct effect applied to tissues acupuncture points and produces reactive vasodilation by decreasing the pain sensation in the sensory nerve endings, spasm in the muscle arterioles. It exerts anti - inflammatory and analgesic effects by promoting regeneration, increasing the release of beta - endorphins through induction of protein synthesis in the synovial fluid, and laser stimulate hematopoiesis in the bone marrow and antibacterial effects by stimulate immune system (5) . Recent studies implicates laser is the regenerative process of the tissue, bone formation, synthesis of the cartilage matrix. High intensity laser therapy recently introduced and advantage of HILT over LLLT, HILT is stimulate large or deeper joints and areas that difficult to reach with LLLT.

HILT works with high peak power (3Kw) and wavelength (1, 064 nm) and is consider as painless, noninvasive therapeutic modality. (6)

Several studies found that LLLT is an effective modality for controlling chronicLBP. Where others found that HILT is a safe & useful modality in reducing pain in patients with chronic LBP. As well, more energy may be transmitted using HILT into the exposed tissues when compared with LLLT. (7)

2. Methodology



An extensive literature search was done, the search used was PubMed, Google scholar, Pedro, Research gate, science direct by using key words.

3. Review of Literature

S. No	Title	Author & Year	Type	Inclusion & Exclusion Criteria	Methodology	Conclusion
1.	Effects of high intensity laser therapy on pain and function of patients with chronic back pain (7)	Hyuen - Woo Choi, 2017	Experimental study	Inclusion: • Age 30 – 65. • Chronic back pain for more than 3 months. Exclusion: • Patients with surgical history in lumbar region. • Spinal tumor/disc infection. • Inflammatory diseases such as rheumatism. • Previous fractures. • Contra - indications for manual therapy.	Included 20 patients divided into 2 groups, one group receives conservative physical therapy for 3 times a week for 4 weeks and other group receives high intensity laser therapy after conservative physical therapy for 3 times a week for 4 weeks. High intensity laser therapy was applied at the level of L1 - L5 and S1 for 10 min.	This article concluded that high intensity laser therapy can be an effective non - surgical intervention method for reducing pain & improves ADL activities ofpatients with the chronic back pain.
2.	Comparison between Epidural Block vs. High Intensity Laser Therapy for controlling Chronic Low Back Pain (8)	Badiozaman Radpay, 2015	Randomized Controlled Double - Blind study	Inclusion: • History of chronic low back pain for at least 3 months. Exclusion: • Degenerative disc disease • Disc herniation • Spine fracture • Spondylosis • Spinal stenosis • Neurological deficits • Abnormal laboratory findings • Systemic & psychiatric illness	101 patients divided into 2 groups were 52 patients fall under Epidural block (EB) group and 49 patients fall underHigh Intensity Laser Therapy (HILT) group. Pain was assessed by using FPS and LINKERT questionaries before procedure and during 1, 4, 12, and 24 weeks after beginning the procedures.	There was no difference between 2 groups. Motor problems seem was less in HILT group comparing EB. This study concluded that both EB and HILT can control the intensity of pain and activities of motor in chronic low back pain patients. Future studies will clarifythe precise importance of each these methods.
3.	A Randomized Comparative Study between High - Intensity and Low -	Walid Kamal Abdelbasset, 2020	A Randomized Comparative Study	Inclusion: • History of low back pain lasting more than 3 months • Age of 25 - 40 years • Ability to comply with any of the randomly selected treatment programs	60 individuals were assigned into 3 groups randomly, 20 in each group. Group one receives Low Level Laser Therapy (LLLT), group 2 receives High	Comparison among the three study groups postintervention showed significant differences in the outcome measures, while comparison between the LLLT and HILT

	LevelLaser Therapy in the Treatment of Chronic Nonspecific Low Back Pain (9)			Exclusion: • Neurological deficits • Abnormal laboratory findings • Fracture • Spondylosis • Spinal stenosis • Inflammatory disease • Infectious diseases • Mental conditions • Prior spinal surgery • pregnancy • Subjects who received any type of treatment for back pain in the last 3 months	Intensity Laser (HILT) and the group 3 did not receive laser therapy (control group). Pain severity, disability, lumbar mobility, and quality of life were assessed before and after 12 - week intervention.	groups showed nonsignificant differences. This comparative study concludes that there are no different influences of LLLT vs. HILT on chronic nonspecific low back pain patients. Both LLLT and HILT reduce pain and disability and improve lumbar mobility and quality of life in chronic nonspecific low back pain patients.
4.	Effect of laser treatment on postural control parameters in patients with chronic nonspecific low back pain (10)	J. Taradaj, 2019	A Randomized Placebo - controlled Trial	Inclusion: • Lumbar hernia disc • Nonspecific chronic pain syndrome with symptom peripheralization into the lower extremity without neurological deficit • History of precious surgery of the spine Exclusion: • Acute and subacute pain episodes in the lumbar region • Sciatica episodes • Degenerative changes of cervical or thoracic region • Past fractures of the bone structures of the spine • Vertebral column tumors, intradural and intramedullary tumors • Vertebral forward dislocation • Rheumatoid arthritis and ankylosing spondylitis • Cauda equina syndrome • Pregnancy or ovulation • Acute and chronic cardiovascular diseases • Arrhythmia and implanted pacemaker • Implanted metal implants • Dermatological conditions in the area of irradiation • Sensory deficits • Psychiatric disorders • Immunological diseases • Infections and elevated temperature • Chronic drug use • Problems with the balance system, labyrinth and inner ear Other central nervous system diseases	Total 68 patients were assigned into 4 groups. First group received high intensity laser therapy at 1064 nm and 60 j/cm² for 10 min (HILT), second group received sham (HILT placebo), third group received low - level laser therapy at 785 nm and 8 j/cm² for 8 min (LLLT) and fourth group received sham (LLLT placebo). In addition, all patients were supplemented with physical exercises (standard stabilization training). To assess postural stability a double - plate stabilometric platform was used. All measurements were performed pre - and post - laser sessions of 3 weeks and at follow - up time points of 1 & 3 months.	By this study concluded that laser procedures led to more balanced posture stability in patients, although these positive changes were significant mainly for short - term observation after 4week therapy. Kruskal - Wallis's analysis of variance (ANOVA) for independent variables did not show any difference between the studied groups. Low - and high - intensity laser therapy does not lead to a significant improvement in postural sway in patients with NSLBP compared with standard stabilization training based on short - and long - term observations.
5.	Long - term effect of high - intensity laser therapy in the treatment of patients with chronic low	Mohamed Salaheldien Mohamed Alayat, 2013	A Randomized Blinded Placebo - controlled Trail	Inclusion: • Age 20 - 50 years • Male patients with a history of chronic low back pain for at least 1 year • Patients with previous history of low back pain episodes & radiographic	72 male patients were included in this study & randomly divided into 3 groups. First group treated with high intensity laser therapy (HILT) plus exercise, second group received	ROM significantly increased after 4 weeks of treatment in all groups, then significantly decreased after 12 weeks of follow - up, but was still significantly more than the baseline value in groups 1

	back pain (11)			findings positive for mild pathology Exclusion: • Spinal surgery • Degenerative disc disease • Disc herniation • Spine fracture • Spondylosis • Spinal stenosis • Neurological deficits • Abnormal laboratory findings • Systemic & psychiatric illness	placebo laser plus exercise (PL + EX), and third group received HILT alone. The outcomes measured by using lumbar range of motion (ROM), assessing the pain by using visual analog scale (VAS) and functional disability by both Roland Disability Questionnaire (RDQ) and the Modified Oswestry Disability Questionnaire (MODQ). Statistical analyses were performed to compare the differences between baseline & post - treatment measurements.	& 2. VAS, RDQ, and MODQ results showed significant decrease post - treatment in all groups, although the RDQ and MODQ results were not significantly different between 2 & 3 groups. This concludes that HILT combined with exercise appears to be more effective in patients with CLBP than either HILT alone or placebo laser with exercise.
6.	Short - term clinical efficacy of the pulsed Nd: YAG laser therapy on chronic nonspecific low back pain (12)	Walid Kamal Abdelbasset, 2020	A randomized controlled study	Inclusion: • Patients with LBP for at least 3 months • Age range of 30 - 50 years **Exclusion** • Orthopedic or neurological abnormalities • Unacceptable biochemical investigations • Positive inflammatory markers • Pregnancy • Cognitive dysfunction • LBP medications for last 3 months • Spinal disorders, injuries, or surgeries	In this study 35 individuals were divided into 2 groups. First groups received Nd: YAG laser therapy and second group received sham laser as a control for 3 days a week for 6 weeks. MODI, PDI, VAS, and ROM have been assessed pre & post - 6 weeks of the intervention.	This study concludes that short - term pulsed Nd: YAG laser therapy can be used to reduce functional disabilities and pain intensity and improves lumbar flexion ROM in patients with chronic nonspecific low back pain.
7.	Effects of High - intensity laser in treatment of patients with chronic low back pain (13)	Marija Gocevska, 2019	Comparative, prospective, monocentric, controlled clinical study	**Inclusion:** • Patients with chronic low back pain that persisted for more than 3 months & pathological findings on lumbar x - rays • Patients advised that not to take any medications up to completion of this study or receive any kind of treatment for back pain • Age between 25 - 65 years **Exclusion:** • Positive neurological examination • Lumbar spine surgery • Congenital malformation • Trauma • Metabolic disorders or cancer • Inflammation • Infection or known photosensitivity	In this study 54 patients were included and randomly divided into 2 groups. First group named as examined group of 27 patients received high - intensity laser & exercises and second group named as control group of 27 patients received ultrasound therapy & exercises. This study results were resulted by using Numeric Pain Rating Scale (NPRS), Oswestry Disability Index (ODI), and Schober's test. Clinical findings were evaluated before treatment and at 2 weeks & at 3 months following treatment.	From this study they concluded that patients with chronic low back pain treated with high - intensity laser has significantly reduced pain intensity, functional disability, and improved ROM. The effect of this treatment has maintained positive for 3 months. Use of high - intensity laser seems to be an effective, safe and useful modality in the treatment of patients with chronic low back pain.

8.	Laser photo - biomodulation is more effective than ultrasound therapy in patients with chronic nonspecific low back pain (CNLBP) (9)	Sayed A. Tantawy, 2018	A comparative study	**Inclusion:** • Patients with chronic low back pain for at least 3 months • Age between 30 - 40 years **Exclusion:** • LBP was due to nerve root compression • Disc prolapses • Spinal stenosis • Tumor • Spinal infection • Ankylosing spondylitis • Spondylolisthesis • Kyphosis or structural scoliosis • Neurological disorder • Pre - surgical candidates • Body Mass Index (BMI) of more than 30 • Severe life - threatening illness	This study was compared to know the effects between laser photo - biomodulation therapy (lPBMt) & ultrasound therapy (UST) in patients with chronic nonspecific low back pain (CNLBP). Total of 45 patients were included in this study & randomly divided into 3 groups. First group received lPBMt along with exercise, and second group received UST along with exercise, and third group known as control group received only exercise for 8 weeks. Before the study and after the study of 8 weeks patients were assessed by using pain, disability, functional performance, and lumbar range of motion.	This comparative study concluded that there were significant improvements in pain, disability, and functional performance in the first 2 experimental groups, but there were no significant changes in the control group. Lumbar range of motion shows significant improvement only in the lPBMt group, while compared with other two groups. Based on their results they concluded that both lPBMt or UST along with exercises for 8 weeks is more effective methods for decreasing pain, reducing disability, and increasing functional performance in patients with CNLBP, although lPBMt is more effective than UST.

4. Discussion

The study aimed to review there is an evidence of improvement in pain, disability, posture and ADL activities, lumbar mobility. After receiving the high intensity laser therapy. Other than all modalities like UST, IFT and high intensity laser therapy shown more effective.

These were assessed by FPS & LINKERT questionnaires, quality of life, and for postural stability & double plate stabilometric platform were used. Disability - Roland Disability Questionnaire & Modified Oswestry disability Questionnaire, Schober's test, pain - VAS, NPRS were analyzed. And total no. of patients was included in the above - mentioned articles & proven null hypothesis.

5. Conclusion

This study concluded that high intensity laser therapy can reduces pain, functional disability, improves lumbar flexion, posture and balance was shown more improvement in chronic low back pain.

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