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Outcome Of *Yoga* Module As Non-Pharmacological Intervention For Chronic Low Back Pain: A Single Arm Clinical Study

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ABSTRACT: **Introduction:** Patients of Chronic Low Back Pain (CLBP) have high percentage among total low back pain cases. In Majority of cases medicinal management are in trend and in some conditions surgical care may require, but majority of CLBP can be managed through a combination of non-pharmacologic interventions such as *Yoga*, exercise, weight management and psychological therapies. Clinical practice guidelines for CLBP recommend physical activity (PA) as one of the most used non pharmacological interventions based on its easily applicable and low cost.

Aims: Present study was undertaken to develop a *Yoga* Module for the management of Chronic Low Back Pain (CLBP).

Materials and Methods: The study was single arm clinical study of 30 Chronic Low Back Pain patients selected randomly. Patients were administered with specific *Yoga* module as Non-pharmacological intervention for 2 months. Assessments of signs and symptoms before and after intervention were carried out by using Visual Analogue Scale (VAS), Stiffness Intensity Numeric Scale (SINS) and appropriately designed grading pattern (0-4) for Difficulty in Movement (DiM).

Result: Statistically highly significant ($p<0.0001$) result in all three main symptoms; Pain (VAS), Stiffness (SINS) and Difficulty in Movement (DiM grade) were noted.

Conclusion: Prepared *Yoga* module as non-pharmacological intervention for CLBP (Chronic low back pain) was effective up to very extent.

Key Words: *Asana*, CLBP, Non-Pharmacological, *Yoga*.

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INTRODUCTION

Throughout the World Musculoskeletal disorders are the leading contributor to disability and out of them low back pain is the main leading cause. As per Global Burden of Disease study in the 2017, musculoskeletal conditions were the highest contributor to global disability (accounting for 16% of all years lived with disability). The prevalence of musculoskeletal conditions varies by age and diagnosis, between 20%–33% of people across the globe live with a painful musculoskeletal condition.[1] Low back pain (LBP) is widespread among the general population and is the one of the top ten most frequent reason for medical consultation among outpatients.[2] Cross-sectional studies from various countries have examined LBP prevalence, the reported point prevalence ranged from 19 to 37 % and the reported lifetime prevalence is from 40 to 86 %.[3][4][5][6]

Most patients suffer from Chronic Low Back Pain (CLBP) experiences pain from more than six months, stiffness in the lower area of the back (lumbar and sacroiliac regions) and mobility impairment. Pain can also radiate in the lower extremities or generalized pain can be present. Patients with CLBP can also experience movement and coordination impairments. This could affect the control of voluntary movements of the patient. It significantly reduce mobility and deftness. It leads to Inadvertence from work, reduce the social participation and accumulated wealth. Longer the Low back pain; generates depression and increase the risk of developing other chronic health conditions. CLBP shows similar risk factors to other non-communicable diseases, such as poor physical activity, obesity and deprived nutrition. Causes behind the Chronic Low Back Pain can be

categorised into organic (such as degenerative lumbar spine/lumbar spinal stenosis, spondylolisthesis, or PIVD like conditions) and non-organic if there is no underlying cause of pain. Patients having CLBP represent the greatest part among the total low back pain cases. In Majority of cases medicinal management are in trend and in some conditions surgical care may require, but majority of CLBP can be managed through a combination of non-pharmacologic interventions such as *Yoga*, exercise, weight management and psychological therapies. Clinical practice guidelines for CLBP recommend physical activity (PA) as one of the most used interventions based on its biological rationale (Anthony Delitto, April 2012) and since it is easily applicable and low cost.[7]

Yoga is an ancient philosophy, originated in India more than 5000 years ago and consists of eight constituents, including stable physical postures i.e. Asana, breathing pattern and techniques i.e. *Pranayama*, relaxation and meditation i.e. *Dhyana*.[8] Certainly, there is a small but rising body of literature suggesting that *Yoga* can increase muscular strength, joint flexibility and balance among patients with CLBP. Recent research has also indicated that *Yoga* can reduce pain catastrophizing, increase pain acceptance and improve overall emotional functioning among individuals with chronic pain.[9]

AIM AND OBJECTIVES:

Present study was started with following aim and objectives:

1. To evaluate the role of *Yoga* as Non-Pharmacological Intervention for Chronic Low Back Pain.
2. To develop a *Yoga* Module for the management of Chronic Low Back Pain.

MATERIALS AND METHODS

Selection of the patients:

Total 30 patients having low back pain problem attending O.P.D. of Department of Swasthavritta of I.P.G.T. and R.A., Jamnagar were selected for Non pharmacological intervention through *Yoga* module. A simple random sampling technique was adopted irrespective of their sex, religion, occupation and educational status. Study was conducted between Jan 2019 to Feb 2020. The conditions to include or exclude in the study was framed (listed below) and strictly followed. After careful evaluation and written consent, patient were selected.

Criteria of Inclusion:

1. Patients having history of Low back Pain from more than 6 months.

2. Feeling Stiffness at low back area.
3. Having Difficulty in movement at the level of low back.
4. Patients aged between 20-60 years.
5. Either Sex.

Criteria of Exclusion:

Patients with Any organic deformity, anatomical distortion, pregnancy, diagnosed case of ischemic Heart Disease, Tuberculosis, Hypertension and Diabetes Mellitus.

Investigation: Routine haematological, biochemical tests and X-ray of lumbosacral region (AP and Lateral view) were carried to rule out any organic deformity or anatomical distortion before going to the intervention.

Study design: Single Arm Clinical Study.

Plan of intervention:

Administered *Yoga* module was directed as non-pharmacological intervention for a fixed duration of 2 months with regular follow up after every 15 days.

Table 1: *Yoga* Module for Chronic Low Back Pain (CLBP)

S.N.	**Group of *Asana***	***Asana***	**Time in Minute**
1.	Warm- up	Small Joints movements	10
2.	Standing Posture *Asana*	*Urdhva Hastasana*	20
		Kati Chakrasana	
3	Sitting Posture *Asana*	*Bhadrasana*,	
		Uttanmandukasana	
4	Supine Posture *Asana*	*Uttanpadasana*	
		Setubandhasana	
5	Prone position *Asana*	*Shalabhasana*	
		Bhujangasana	
6	Relaxation-	*Shavasana*	15
		Nadisodhana & Bhramari Prananayama	
		Om chanting	

Method of assessment

Effects of *Yoga* module on chronic low back pain were assessed by application of different scale of subjective criteria before and after the intervention. Assessments of improvements in signs and symptoms before and after intervention were carried out by using Visual Analogue Scale (VAS) for pain assessment and Stiffness Intensity Numeric Scale (SINS) for stiffness was used. Whereas appropriately designed grading pattern 0-4 (0 for No difficulty and 4 for extreme) was used for the assessment of difficulty in Movement.

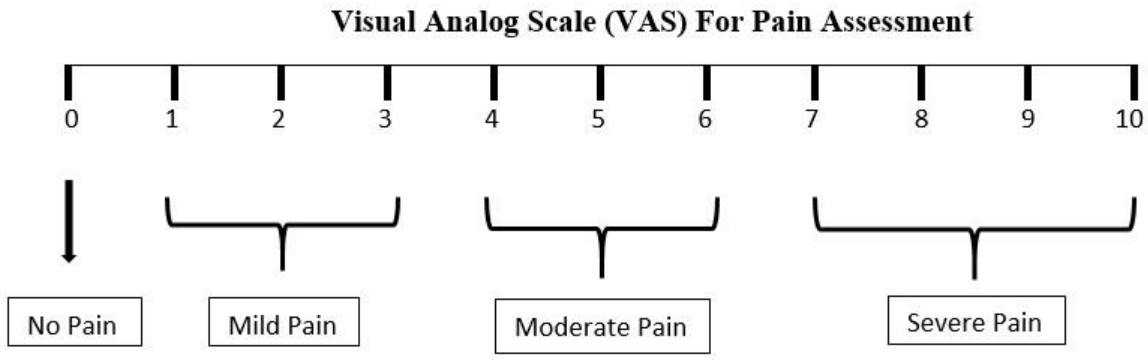
For overall therapeutic efficacy obtained data were analysed using Microsoft excel, NCLL and Sigma Stat. Observations and results pertaining to clinical parameters were presented in tabular form along with the findings of statistical analysis. Paired 't' test was adopted to find out the effect of intervention for comparative effect before and after. Wilcoxon signed Rank test were used for the testing of hypothesis in qualitative data of all the symptoms.

ASSESSMENT CRITERIA:

Subjective Parameters:

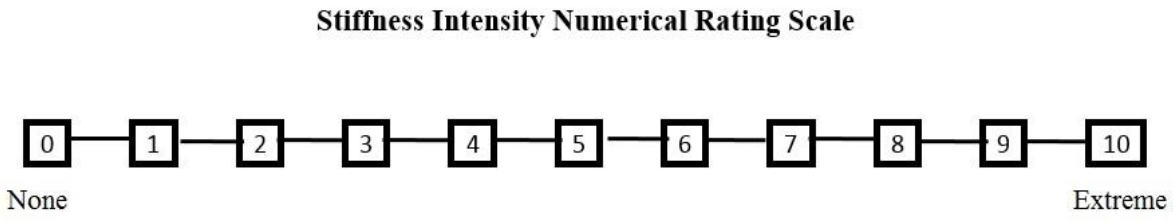
A. Visual Analogue Scale (VAS) for pain assessment [10]

Figure 1:



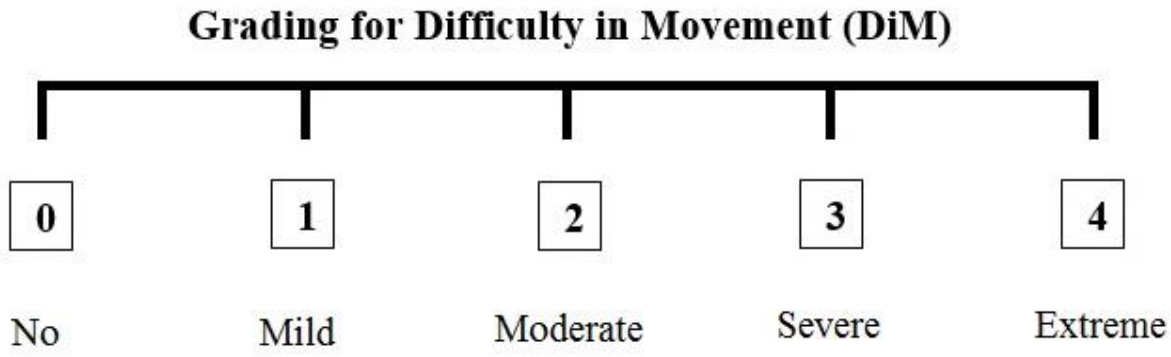
B. Stiffness Intensity Numeric Scale (SINS) for stiffness [11]

Figure 2:



C. Grading pattern 0-4 for difficulty in Movement

Figure 3:



Life style Modification

Aahara (Diet): Patients were kept on *Aama Shamaka* and *Vibandha Nashaka, Laghu, Grahi*, and *Pathya* (favourable food) such as whole wheat, Barley, *Phaseolus aureus*, green leafy vegetables. Avoid acidic food like lemon, curd, tomato, orange, tamarind.

Vihara (Routine): Patient were instructed to follow the *Dincharya* (daily routine) like early morning wakeup, to stop late night work, day time sleep and wrong posture for long time.

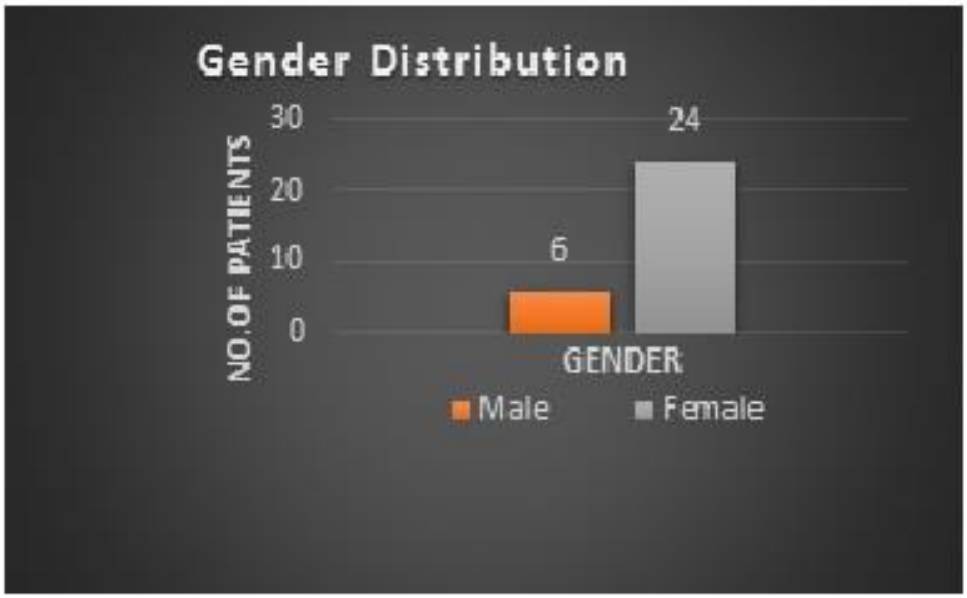
OBSERVATIONS

In this study more than 80% of the patients were belonged to the 30 – 50 years age group [Diagram 1], 80% of total patients were females [Diagram 2], Maximum patients had sedentary (seating and/or house hold activities) life style throughout the day, out of total 70 % were performing only house hold activity on her home. [Diagram 3].

Age wise distribution of Patients:

Graph Diagram 1: Distribution of the patients according to age

Graph Diagram 2: Distribution of the patients according to Gender



Graph Diagram 3: Distribution of the patients according to Type of Activity

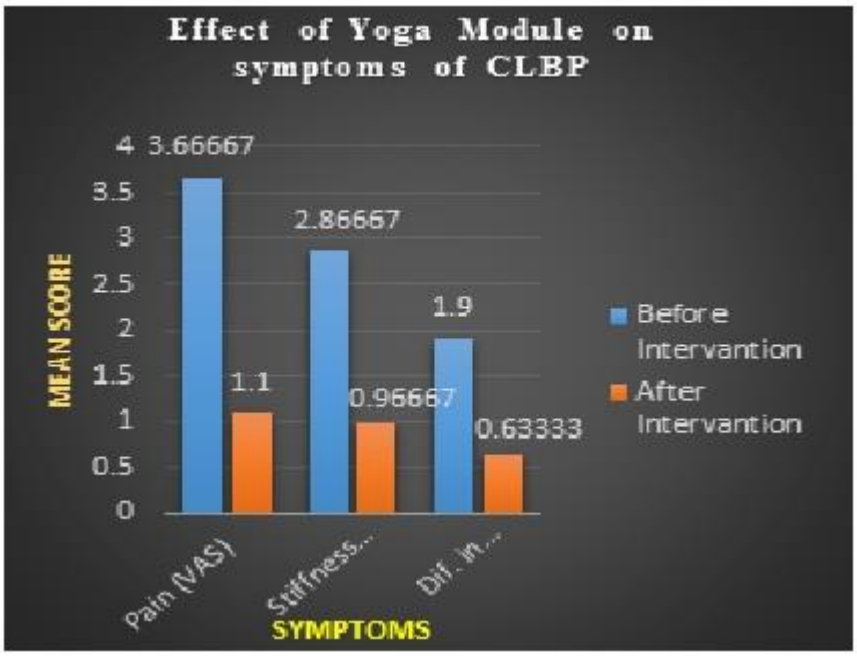
All Patients of CLBP had more than of 6 months of history of low back pain without any structural deformity. Lower back Pain, stiffness and difficulty in movements were present in all CLBP patients. All patients were completed *Yoga* practice under observation of 6o days during the study. 30% patients completed in morning session (8-9 AM) and 70% patients attended the *Yoga* procedures in evening (5-6 PM) session. In the first week of intervention 34 % patients felt muscular stretching and mild body ache and from second week patient's pain were gradually decreases. After completion of total duration of intervention (60 days) patients came to their normal routine life with maximum relief. In this study total 31 patients were enrolled and after 13 days out of 31 only 1 patient was dropout due to some personal reason.

Statistical Analysis

Table 2: Effect of *Yoga* Module on symptoms of CLBP

S.N.	Symptoms	Mean Score		% Relief	S.D.	S.E.	t *Value*	P *Value*
		BT	AT					
1	Pain (VAS)	3.66667	1.1	70%	0.72793	0.132902	19.3125	<0.0001
2	Stiffness (SINS)	2.86667	0.96667	66.28	1.12495	0.20539	9.2508	<0.0001
3	Difficulty in Movement (DiM grade)	1.9	0.63333	66.67	0.63968	0.11679	10.8457	<0.0001

Graph Diagram 4: Effect of *Yoga* Module on symptoms of CLBP



RESULTS

At the end of interventions statistically highly significant $p<0.0001$ result in all three main symptoms; Pain (VAS), Stiffness (SINS) and Difficulty in Movement (DiM grade) were noted. Patients showed 70% relief in pain, 66.28% in stiffness and 66.67% improvement in Difficulty in Movement. Wilcoxon singed rank test at $\alpha= 0.05$, $p<0.00001$, shows highly significant result for all three symptoms.

DISCUSSION:

The musculoskeletal system comprises of bones and joints with their adjacent structures, as well as muscles, tendons and ligaments. Chronic Low back pain (CLBP) is the most common musculoskeletal cause of disability. But CLBP is not a life-threatening condition, it constitutes a major public health problem in the societies. LBP affects a large number of people each year and is the cause of severe discomfort and financial losses. Early intervention prevents the high-grade disability. Chronic low back pain has generally started with muscular weakness or inflammation due to causative factors. Skeletal muscles function to produce force and motion. They are primarily responsible for maintaining and changing posture, locomotion. Continuous seating and steady posture create inflammation activity and regular participation in physical activity promotes healthy weight, bone mass, and muscle function. Physically active participants maintain lower levels of inflammatory markers.[12]

Physical activity, inflammation, and health are linked together in a complex fashion. Cytokines are secreted transiently in large doses by several metabolically active tissues during exercise, namely from the muscle during contraction and adipose tissue via exercise-related mechanisms. Paradoxically, regular (long-term) exercise training has consistently been associated with lower levels of systemic inflammatory markers.[13] The expression of exercise-regulated muscle genes such as the transcriptional co activator PGC1α (PPARG coactivator 1 alpha) is thought to promote anti-inflammatory effects through a transient release of cytokines[14] and possibly explains some of the systemic and beneficial effects of exercise in non - muscle tissue.[15] Engaging in a *Yoga* intervention may affect the serum levels of IL-6 (Interleukin 6) and their epigenetic profile of immune factors, specifically TNF (Tumour necrosis factor).[16]

Yogasana, various specific postures of the body in which variety of muscles are engaged. Term Posture is described for the relative position of the body segments during rest or activity. Good posture is a cooperation between minimized the load on the spine with minimum muscle work required. Naturally there is lordosis at lumber region having $30\text{-}45^0$ at lumbosacral area. Commonly this lordosis decreased or flattened or reversed in people either with acute or chronic low back pain. The muscles responsible for this posture include erector spinae, rectus abdominis, the internal and external oblique, psoas major, iliacus, the gluteal and hamstring muscles.[17]

Incorporated *Asana* in *Yogic* module, creates self-controlled musculoskeletal traction instead of mechanical traction. (Due, 2000) Basically they released the unnecessary pressure and burden on vertebras.[18] On standing posture, there is certain amount of pull and push force due to weight compression and gravity respectively[19] and it plays an effective role in releasing the tensile force up to sarcomere level.

Mode of Action:

Urdhva Hastasana: Person standing erect with stretched hands raised over head. In this *Asana* elevated scapula produces stretching force on either side of thoracic and lumbar vertebras through Rhomboid major, Rhomboid minor, trapezius and serratus anterior muscles. It reduces the pressure between thoracic vertebras due to weight and gravity and helps in increasing the intervertebral space. At the same time stretched Erector spinae and Iliocostalis muscles produces same effect at lumber and sacral region by pulling in upward direction. Hamstring and thigh muscles produce same effect at sacral region by stretching them in downward direction[20].

Kati Chakrasana: In it person twists his truncal region on standing posture and brings his arm on back with wrapping the thorax from anterior side in contralateral way. This *Asana* produces the stretching effect on one side and relaxing effect on other side of deep small muscles (Rotator longus, Rotator bravis[21] , Short rotator, Interspinales[22] and Qudratus lumborum[23]) attached to thoracic and lumbar vertebras. It reduces the

intervertebral and intra vertebral pressure produced due to wrong postural habit.

Bhadrasana: It affects the major key muscles of back and hip joint. Here stretched Psoas major and Iliacus produce oblique stretching and repositioning of lumbar as well as sacral vertebra. Stretched Adductor longus, Adductor bravis, Gracilis and Quadratus femoris helps in repositioning of pelvis and releases the extra pressure on lumbosacral vertebras[24].

Uttanmandukasana: In addition to the effects of *Bhadrāsana, Uttanmandukasana* give more forward convexity to the vertebral column. It releases the unnecessary extra tensile force on spine by relaxing mainly Longissimus, Spinalis, Multifidus [25], Latissimus dorsi and Iliocostalis muscles. This relaxation induces and helps in restoration of their normality.

Uttanpadasana: In this *Asana* because of lying condition, weight compression and gravitational pull goes minimised and intervertebral space becomes comparatively more. During raised leg situation gluteal and hamstring muscles are stretched and they pull the pelvis as well as lumbar muscles and ultimately helps in reducing the pressure over intervertebral discs [26].

Setubandhasana: This asana produce a moderate stretching force in lumbosacral region and anterior of thigh. During this *Asana* the key muscles works are Latissimus dorsi, Serratus posterior inferior, Psoas major, Iliacus, Interspinales, Qudratus lumborum and Iliolumbar ligament [27]. This *Asana* helps in removing the minor deviation of normal curvature of vertebral column at lumbosacral as well as thoracic part.

Shalabhasana: It relaxes the Serratus anterior, Serratus posterior inferior [28], Iliocostalis, Spinalis, Longissimus muscles and Latissimus dorsi and at same time stretches the Rectus abdominis, Internal and External Oblique muscle and muscles of anterior of thigh. This asana helps in maintaining normal curvature of vertebral column at lumbosacral[29].

Bhujangasana: It produce a moderate stretching force in lumbosacral region and anterior of thigh. Thyrohyoid, omohyoid, sternohyoid, Seratous anterior, rectous abdominis, external and internal oblique muscles are involved.[30] This *Asana* give more forward convexity to the vertebral

column and releases the unnecessary extra tensile force on spine.

Shavasana: It relaxes all the extra tensile forces from each body muscles. *Shavasana* has been found to reduce physiological arousal[31], and to be effective in helping practitioners cope with stress manifestations, for example, Bera et al. found recovery from induced physiological stress was significantly faster for supine posture with additional progressive relaxation, compared to resting, sitting in a chair, or plain *Shavasana* (SR).[32]

Nadi sodhana & Bhramari Pranayama- *Nadi Shadhana Pranayama* provide the more time for gaseous exchange between cells and blood flow. This longer duration facilitate comparatively more metabolic gaseous wastes removal at cellular level which enhance the antioxidant activity and self- repair of the cells. Regular practice of *Nadishodana Pranayama* decreases in pulse rate, diastolic blood pressure and systolic blood pressure along with significant increase in pulse pressure.[33] Meditation is a *Yogic* process of providing deep rest to the system by allowing the mind to calm down to its basal states. It is a relaxation technique and decreases stress.[34]

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CONCLUSION

The attained observations and result by deigned *Yoga* module as non-pharmacological intervention for CLBP (Chronic low back pain) is effective up to very extent. After completion of total duration of intervention (60 days) patients came to their normal routine life with maximum relief.

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