

Effect of Selected Yogic Practices on Pain and Disability in Patients with Lumbar Spondylitis

Abstract

Aim: The study was designed to find the effect of selected yogic practices on lumbar spondylitis. **Materials and Methods:** This was a prospective, randomized study without a control trial. A total of 172 participants with lumbar spondylitis (age 21–79 years) from the outpatient department (OPD) of neurosurgery, AIIMS, Bhubaneswar, were randomly assigned to receive yoga therapy. The module of selected yogic practices consisted of pawanamuktasana series 1 (loosening and strengthening), asana, pranayama, and relaxation techniques *Yoga Nidra*. **Statistics Analysis:** Within groups, comparison was done by paired *t*-test, and between groups, ANOVA test was carried out to determine the significant difference among the various groups under study. Correlation regression analysis was done to measure the degree of linear relationship between pre- and post-study for various groups. **Results:** Significant differences were observed with yoga therapy in instant relieve practice group, in short-term practice group, and in long-term practice group (LTPG) with better results in LTPG. **Conclusion:** Selected yoga therapy has got the better result in management of pain in lumbar spondylitis.

Keywords: *Experimental group, lumbar spondylitis, Roland–Morris back pain questionnaire, yogic practice*

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Introduction

Backache, which was known as an ancient curse, is now known as a modern international epidemic. Lumbar disc disease is an important cause of low backache so much so that people have perceptions that all low backaches are due to disc prolapse.^[1] According to one study, almost 80% of people in modern industrial society will experience back pain at some time in their life. It is common in women who have had several pregnancies.^[2] The usual symptoms of back disorders are pain, stiffness and deformity in the back, and pain paresthesia or weakness in the lower limbs.^[3] Minorities with low back pain (LBP) receive less patient education.^[4] Back injury is the leading and most expensive cause of workers' compensation claims.^[5,6] Back pain is one of the most common complaints seen in physician's offices. A survey done by the CDC in 2010 reported that back symptoms were the primary reason for 1.3% of office visits in the United States, and spinal disorders were responsible for 3.1% of diagnoses in outpatient clinics.^[7] A 2012 systematic review by Hoy *et al.* estimated

that the global point prevalence of activity-limiting LBP lasting more than a day was 12% and 1 month was 23%.^[8] The etiology of back pain is not fully researched and understood; however, the psychological, psychosocial/occupational, and physical factors are considered as strong causative factors.^[9]

Medical expenditures for LBP in minorities are 30% lower than for Whites' back surgery.^[10] Patient satisfaction with the effectiveness of conventional LBP treatment is relatively low.^[11] Spinal pain is a condition for which often - complementary therapies are being used.^[12] Despite the ubiquity of back pain, it is one of the conditions that modern medicine does not treat well, partly due to imprecision of diagnosis and relative ineffectiveness of most conventional treatments. Although yoga may have the potential to ameliorate both chronic and acute pain in general, the mechanisms by which this is affected remain hypothetical.^[12] Nevertheless, today, yoga is quite commonly used as complementary treatment for spinal pain.^[13] There are many muscles in the low back including larger powerful muscles such as

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iliopsoas and erector spinae, as well as smaller muscles such as multifidi, semispinalis, and rotators. These muscles along with the external and internal oblique and rectus and transverse abdominis are responsible for the stability of the spine as well as the spine's basic movements. It is important for these muscles to be not only strong but also flexible. If these muscles are weak or deconditioned, they cannot efficiently stabilize the spine, leading to instability and injury. Muscular imbalances in strength and tone exert uneven forces on their bony or facial attachments, contributing to poor body mechanics, injury and pain. There is positive evidence of yoga therapy for the treatment and management of chronic low back pain. Thus, there is a substantial need for research to identify more helpful therapies. The art and science of yoga have infinite possibilities for providing answers to most health problems, troubling modern humankind. However, we often misunderstand this science and want it to be a miracle pill. A pill that we take only once and want all the problems to vanish into thin air. Yoga is a holistic science and must be learned and practiced with a holistic view.

Reviews and meta-analyses^[14,15] and practice guidelines from the American Pain Society and the American College of Physicians^[12] support yoga as an evidence-based treatment for LBP with at least moderate benefit. However, no studies to date have compared yoga's effectiveness to physical therapy (PT), the most commonly nonpharmacologic reimbursable treatment that physicians recommend.^[16]

Materials and Methods

A total of 200 patients with lumbar spondylitis from OPD of neurosurgery were recruited for the study [Figure 1]. A sample size of 172 was randomly selected for the study in the age group between 21 and 79 years (29 ± 14.814) of both genders [Table 1]. All patients were referred from the Department of Neurosurgery to yoga therapy center, in the Department of AYUSH, AIIMS, Bhubaneswar.

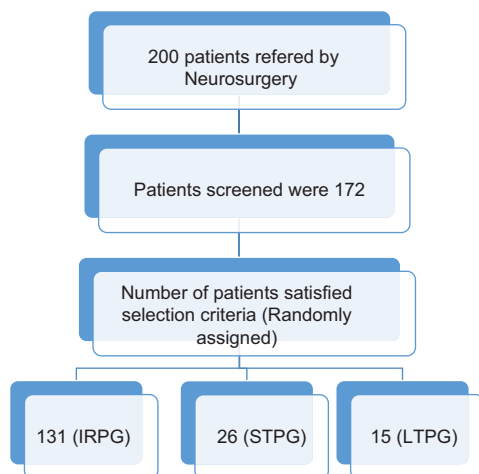


Figure 1: Trial profile

Inclusion criteria

1. Patients having persistent pain for 6 months prior to recruitment
2. Patients having moderate to severe pain while walking or standing
3. People having diabetes, hypertension, and bronchial asthma
4. The disease was diagnosed through chief complaint from patients along with X-ray and magnetic resonance imaging report.

Exclusion criteria

Persons suffering from trauma, tuberculous, arthritis, and major psychiatric problem were excluded from the study.

Design of the study

This was a prospective, randomized study on patients having lumbar spondylitis but without a control group. Patients attending the OPD of neurosurgery, AIIMS, Bhubaneswar, of who were diagnosed with lumbar spondylitis and satisfied the inclusion criteria were recruited for the study. After the initial screening for selection criteria, they were assigned to the yoga OPD for experimental group. The experimental group was divided into three subgroups such as instant relieve practice group (IRPG), short-term practice group (STPG), and long-term practice group (LTPG).

Experimental group

The patients of experimental group were divided into three subgroups such as IRPG, STPG, and LTPG. The sample size of IRPG was 131; STPG and LTPG were 26 and 15, respectively. The IRPG was practiced only 1 h of the very day after referred from the Department of Neurosurgery whereas the STPG and LTPG were practiced for 15 days and 1 month in a regular basis in the morning time from 9 AM to 10 AM, except Sunday.

Intervention for yoga group

At the yoga therapy center, 1 h of selected yoga therapy was given as a daily routine practice to the patients suffering from lumbar spondylitis. These practices include pawanmuktasana series 1 (joint exercises), backward bending series, pranayama *nadisodhana* and *bhramari*, and short relaxation *Yoga Nidra*.

Yoga module for lumbar spondylitis

Selected yogic practices were made to practice by the patient for 60 min for all groups such as IRPG, STPG, and LTPG in different intervals 1 h, 2 weeks, and 2 months at the yoga therapy center. This included the various practices [Table 2].

The concept used to develop a specific module of selected yogic approach of yoga therapy for lumbar spondylitis was taken from the authentic book called *Asana Pranayama*

Table 1: Demographic profile (age sex distribution of the respondents, n=172)

	Age category						Total (%)	Mean±SD
	20-30	30-40	40-50	50-60	60-70	70-80		
Male	9	15	23	15	10	1	73 (42)	12±7.387
Female	14	25	21	20	17	2	99 (58)	17±8.019
Total (%)	23 (13)	40 (23)	44 (26)	35 (20)	27 (16)	3 (2)	172 (100)	29±14.814
Mean±SD	12±3.535	20±7.071	22±1.414	16±3.535	14±4.95	2±0.707	86±18.384	
Duration of the disease (years)					82			
<1					64			
1-2					26			
>2								
Associated problems								
Diabetes					55			
Hypertension					23			
Asthma					12			
Neck pain					43			
Obesity					33			

SD = Standard deviation

Table 2: Yoga module for lumbar spondylitis

Yoga asana	Frequency
Pawanamuktasana series 1	
Toes bending	10 rounds, 2 min
Ankles bending	10 rounds, 2 min
Ankles rotation	10 rounds, 2 min
Ankle crank	10 rounds, 2 min
Knee bending	10 rounds, 2 min
Knee rotation	10 rounds, 2 min
Full butterfly	10 rounds, 2 min
Fingers stretching	10 rounds, 2 min
Wrist bending	10 rounds, 2 min
Wrist rotation	10 rounds, 2 min
Elbow bending	10 rounds, 2 min
Shoulder rotation	10 rounds, 2 min
Neck rotation	10 rounds, 2 min
Backward bending series of asana	
Makarasana	1 min
Bhujangasana	1 min
Sarpasana	1 min
Sarala Salabhasana	1 min
Tadasana	1 min
Tiryakatadasana	1 min
Kati chakrasana	1 min
Ardha kati chakrasana	1 min
Pranayama	
Nadisodhana	3 min
Bhramari	3 min
Relaxation	
Yoga Nidra	20 min

Mudra Bandha and *Yoga Nidra* developed by Swami Satyananda Saraswati from Bihar School of Yoga, which highlights a holistic approach for integral health at physical,

mental, emotional, and spiritual levels.^[17,18] Yoga is defined as a systematic approach or process of gaining control over the mind.^[19] Yoga offers a holistic solution. The first-level handling is at the body level to use techniques of relaxation. Simple asanas provide mastery over different groups of muscles by increasing the elasticity of the muscles fibers and releasing tensions and stresses.^[20] The daily routine included a 1 h practice of asana, pranayama, and relaxation practice such as *Yoga Nidra*.

Asana

Asanas are any physical posture featured by effortless maintenance in the final posture, i.e., *sthira sukham asanam*.

- Pawanamuktasana series 1 (loosening and strengthening practices): This group of asanas concerned with loosening of the joints of the body. By the practice of these asanas, all joints, muscles, and ligaments come to play and it gives gentle massage to eliminate the energy blockages in the joints
- Backward bending series: This series tones up the back muscles, followed by relaxation
- Standing and stretching asana: This series of asana gives a good stretch to the entire body including back muscles.

Pranayama

Pranayama means prolongation of breath to increase the efficiency of lungs capacity. It also promotes autonomic balance through mastery over the mind.^[20]

Relaxation

Yoga Nidra: It is a relaxation technique developed by Swami Satyananda Saraswati of Bihar School of Yoga. It is a powerful technique of inducing complete physical,

mental, and emotional relaxation including a qualitative sleep.^[21]

Outcome variables

The Roland–Morris back pain and Disability Questionnaire (RMDQ) was used to assess the pain and disability after the intervention of yoga on different groups of experimental group. The questionnaire contains 24 questions aimed at assessments of the status of participant’s pain and disability.^[22]

Statistical methods

The data were analyzed using SPSS version 16.0 (IBM, Chicago, IL, USA) package under Windows XP environment. The baseline values of the three groups were checked for normal distribution by Kolmogorov–Smirnov one-sample test. Paired *t*-test was used to test the significant effect of yoga therapy on reduction of pain and disability in each study group (IRPG, STPG, and LTPG). ANOVA test was conducted for accessing the significant difference within and between the groups. The correlation and regression analysis were done to determine degree of linear relationship between yoga therapy and pain disability.

Results

Table 3a and b shows the results within the experimental group of IRPG, STPG, and LTPG.

Pain

This measures all activities of 24 items in the questionnaire. In IRPG, mean ± standard deviation (SD) of the pain (pre-post) was 3.333 ± 2.967 and *P* < 0.001. Moreover, the prescore of pain was 15.203 and postscore was 11.737; the reduction of pain was 22.80% after 1 h practice of yoga therapy. This shows the reduction of pain and disability. In STPG, mean ± SD of the pain (pre-post) was 7.308 ± 1.995 and *P* < 0.001. Moreover, the prescore of pain was 14.231 and postscore was 6.923; the reduction of pain was 51.35% after 15 days practice of yoga therapy, which shows the reduction of pain and disability in the experimental group. Similarly, in LTPG, mean ± SD of the pain (pre-post) was 10.00 ± 1.915 and *P* < 0.001. Moreover, the prescore of pain was 15.615 and postscore was 5.615; the reduction of pain was 64.04% after 1 month practice of yoga therapy, which indicates the reduction of pain in this group [Table 4a and b].

Analysis of variance (among all three IRPG, STPG and LTPG) did not contribute outcome (*F* = 1.050 which is insignificant at 5% level of significance) before yoga therapy. After yoga therapy, there is significant difference among the three groups where *F* = 45.976 which is highly significant at 5% level of significance. Multiple comparisons of the postscores after yoga therapy of the three groups by least square difference method reveal that there exists a high significant difference

Table 3a: Analysis of variance (prescore)

Prescores	Sum of squares	df	Mean square	<i>F</i>	Significant
Between groups	24.481	2	12.240	1.050	0.352
Within groups	1969.211	169	11.652		
Total	1993.692	171			

Table 3b: Analysis of variance (postscore)

Postscores	Sum of squares	df	Mean square	<i>F</i>	Significant
Between groups	845.915	2	422.958	45.976	0.000
Within groups	1554.713	169	9.199		
Total	2400.628	171			

Table 3c: Pre- and post-correlations for each variable

Variables	<i>r</i>	Types of correlation
IRPG (pre-post)	0.897	Positive
STPG (pre-post)	0.871	Positive
LTPG (pre-post)	0.827	Positive

IRPG = Instant relieve practice group, STPG = Short-term practice group, LTPG = Long-term practice group

Table 4a: Experimental groups

Pre-post	Mean±SD	95% CI		<i>P</i>
		LB	UB	
IRPG Pain (pre)-pain (post)	3.333±2.967	2.822	3.8442	<0.001
STPG Pain (pre)-pain (post)	7.308±1.995	6.502	8.114	<0.001
LTPG Pain (pre)-pain (post)	10.00±1.915	8.8429	11.157	<0.001

IRPG = Instant relieve practice group, STPG = Short-term practice group, LTPG = Long-term practice group, CI = Confidence interval, LB = Lower bound, UB = Upper bound, SD = Standard deviation

Table 4b: Percentage change

Score	IRPG	STPG	LTPG
Prescore	15.203	14.231	15.615
Postscore	11.737	6.923	5.615
Percentage of decrease	22.80	51.35	64.04

IRPG = Instant relieve practice group, STPG = Short-term practice group, LTPG = Long-term practice group

in mean between IRPG and STPG (mean difference [MD] = 4.81377*) and also between IRPG and LTPG (MD = 6.12146*). However, there exists no significant difference in mean postscores between STPG and LTPG (MD = 1.30769).

Regression analysis and model formulation

A linear regression analysis was conducted to determine the relationship between the effect of selected yogic practices on pain and disability in lumbar spondylitis.

The result showed that there exists a high degree of linear association between pre- and post-score between yogic practices and pain and disability in IRPG ($r = 0.897$). They were positively correlated with each other [Table 3c].

In STPG, there exists a positive correlation between pre- and post-study of yoga therapy and pain and disability where $r = 0.871$.

Similarly, in LTPG also, the correlation study is positive after 1 month practice of yoga therapy where $r = 0.827$.

Discussion

The RMDQ was used to assess the pain and disability after the intervention of yoga on different subgroups of experimental group. The questionnaire contains 24 questions aimed at assessments of the status of participant's pain and disability.^[22]

This is a randomized experimental trial on 172 patients of both genders in age 21–79 years with lumbar spondylitis. In the current study, there is significant reduction in pain and disability in all groups: IRPG, STPG, and LTPG ($P < 0.01$). The LTPG group (1-month practice) showed a better result than STPG group (15 days practice) and IRPG (1 h practice) ($P < 0.01$).

There is significant difference in IRPG with STPG and LTPG ($P < 0.01$). However, there is no significant difference between STPG and LTPG ($P < 0.05$). The linear regression analysis showed that there is high correlation before and after practice of yoga in all three groups such as IRPG, STPG, and LTPG.

Pain reduction

The production in pain observed in our study points to the beneficial effect of only yoga on patients having pain and disability.

There are other studies on effect of yogic practices on back pain. Tekur *et al.*^[23] studied the efficacy of the integrated approach of yoga therapy in patients with CLBP and documented 48.8% reduction in Numerical Rating Scale scores in the yoga group.

A meta-analysis of randomized controlled trial (RCT) done by Holtzman and Beggs in 2013 examined the current literature for the strongest evidence of the efficacy of yoga as a potential treatment for CLBP.^[24] Tilbrook *et al.* found that offering a 12-week yoga program to adults with CLBP or recurrent LBP led to greater improvements in back function than usual care for up to 12 months. Yoga seems to be a safe and effective activity that clinicians could consider recommending for patients with a history of LBP.^[25]

Saper *et al.* found that 108 participants in both the yoga and PT group would provide 90% power to detect whether yoga is truly noninferior to PT with respect to effect on

pain. Similarly, 107 participants in both the yoga and PT group would provide 81% power to detect whether yoga is truly noninferior to PT with respect to effect on function.^[26]

In the pilot RCT study of Cox *et al.*,^[15] change as measured by the RMDQ was the primary clinical outcome (changes in the ABPS, short-form-12, EQ-5D, and pain self-efficacy were secondary clinical outcomes). The United Kingdom back pain exercise and manipulation trial found that a change in the RMDQ score of 1.57 points was a cost-effective difference. Although there is no consensus, a change of 1.1–2.5 on the RMDQ has been recommended as clinically important.^[27,28] This scale has been found to be sensitive to change, reliable, and valid. At 4 weeks follow-up, 80% of the yoga group had improved by at least two points compared to 37.5% of the control group, MD 1.88 (95% confidence interval [CI] = -3.18 – 6.94), $P = 0.43$ for RMDQ and MD 8.39 (95% CI = 1.18 – 15.6), $P = 0.03$ for visual analog scale. At 12 weeks follow-up, 66.6% of the yoga group had improved by at least two points on the RMDQ compared to 55.6% of the usual care group ($P = 0.72$).^[15]

In our study, there is significant reduction in pain and disability in all groups: IRPG, STPG, and LTPG. The LTPG group (1 month practice) showed a better result than STPG group (15 days practice) and IRPG (1 h practice). Tilbrook *et al.*^[25] completed an RCT in 2011 that compared the effectiveness of yoga and usual care for CLBP or recurrent LBP. A total of 313 adults with CLBP were randomly assigned to either a yoga intervention group ($n = 156$) or usual care group ($n = 157$). All patients received a back pain education booklet. The intervention consisted of a 12-class progressive yoga program that spanned 3 months. Scores were measured on the RMDQ at 3, 6, and 12 months. The yoga group had better back function at 3, 6, and 12 months than the usual care group. The yoga group also had higher pain self-efficacy scores at 3 and 6 months but not at 12 months. The two groups however had similar back pain and general health scores at 3, 6, and 12 months.^[29] Another 2013 systematic review and meta-analysis of the literature on yoga for LBP by Cramer *et al.*^[30] screened studies published through 2012 that were RCT comparing yoga to control conditions in patients with CLBP. The main outcome measures were pain, back-specific disability, generic disability, health-related quality of life, and global improvement. Standardized MDs (SMDs) and 95% CIs were calculated for each outcome. The review included ten studies with 967 patients with CLBP. There was strong evidence for short-term effects on pain (SMD = -0.48 ; 95% CI = -0.65 to -0.31 ; $P < 0.01$) and back-specific disability (SMD = -0.59 ; 95% CI = -0.87 to -0.30 ; $P < 0.01$). There was also strong evidence for a long-term effect on back-specific disability (SMD = -0.35 ; 95% CI = -0.55 to -0.15 ; $P < 0.01$). There was no evidence of short-term or long-term effects on health-related quality of life. Yoga was not associated with any serious adverse event in any of these studies.

In our study, the linear regression analysis showed that there is high correlation before and after practice of yoga in all three groups such as IRPG, STPG, and LTPG. An evaluation of yoga's impact on the gunas and self-ideal disparity found significant correlations between self and ideal self for the yoga group but not for the control.

A study on Hatha yoga practice and body mass index (BMI) and reduced medication use in women over 45 years by Moliver *et al.* performed bivariate correlations and multiple linear regressions to analyze the relationship of current hours per week, total lifetime hours, and total calendar years to BMI for yoga practitioner. Bivariate analyses showed a significant inverse relationship between extent of yoga experience and BMI. In the regression analysis, the relationship remained significant between total lifetime hours of yoga and BMI ($P = 0.01$) and between current hours of yoga per week and BMI ($P = 0.04$), after accounting for hours of weekly nonyogic exercise and refined and processed food consumption.^[31]

Summary of evidence

One of the primary causes of back pain is muscle tension;^[32] more people are now work stressed and have mechanical stiffness that primarily affect not only the spine but also the hips and shoulders. Regular yoga workup stretches the muscle and loosens them, which were previously tense.^[33] Yoga directly helps people where back pain is directly related poor posture. The findings showed there was a significant reduction in pain intensity in the long-term yoga practice group. The authors reasoned that yoga might enhance both the toning of muscles and releasing of muscle tension. Relaxation responses, therefore, could reduce stress-related muscle tension and modify neurobiological pain perception. The authors also suggested that as yoga practitioners develop increasing awareness of muscle use and joint position, they could better change habitual posture patterns in daily life.

Yoga is often recommended as an evidence-based additional therapy intervention for back and neck pain. Being more than exercise, yoga seems to be able to improve body awareness and pain acceptance, and coping yoga is defined as “*samatvam yoga*” in Bhagavad Gita.^[34] The harmony in between body, mind, and emotion is achieved by multifactorial approach of yoga such as asana, pranayama, and relaxation practice (*Yoga Nidra*).

Limitations

This study contained the unequal size of sample in experimental group without a control group.

Suggestions for future work

Further studies focus on the long-term effectiveness more than 6 months of yoga practice are necessary to check for acceptability on pain. Studies on biochemical variables may throw light on the mechanisms.

Conclusion

Based on the results obtained, the following conclusions were drawn:

1. The effect of selected yogic practices is beneficial among people suffering from lumbar spondylitis for reduction of pain and disability
2. The effect of selected yogic practices is effective in all three groups such as IRPG, STPG, and LTPG groups. However, it is more effective in LTPG group
3. The effectiveness of selected yogic practices has significant difference in between IRPG and LTPG, IRPG and LTPG, but there is no significant difference in between STPG and LTPG
4. The regression analysis shows that there exists a high degree of linear association in all three groups such as IRPG, STPG, and LTPG.

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Conflicts of interest

There are no conflicts of interest.

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