ABSTRACT

INTRODUCTION:

Low back pain (LBP) is a common medical problem. Low-back pain (LBP), usually has pain or discomfort in the area between the lower rib and the gluteal folds and is coined commonly as a potentially disabling condition. Prevalence rate of low back pain in 3 months duration is estimated to be around 25%, where it is as high as 84% in lifetime. LBP is classified as acute (less than 6 weeks), subacute (between 6 weeks and 12 weeks) and chronic (more than 12 weeks). Chronic low back pain is a common musculoskeletal disorder affecting 80% of people at some point in their lives. Core stability is defined as the ability to control the position and movement of the central portion of the body. It is vital for proper load balance within the spine, pelvis, and kinetic chain. Clinical spinal instability is a controversial topic and is not well understood. Researchers found loss of the tonic activation of transverse abdominis muscle in low back pain patients during walking. There is a strong association between low back pain and respiratory disorder as well as incontinence.

LBA leads to the instability of the spine. that the patients with LBA have poor automatic control of the transverse Abdominal (TrA). This was in support with the previous research finding of delayed onset of the TrA contraction in LBA as well as other stabilizer muscles of the lower back and absence of its tonic and pre-adjusting function. Repeated imaging of the multifidus shows atrophy of the muscle in cLBP. In neuromuscular weakness, the respiratory muscles have a reduced ability to generate the optimal lung volumes and pressure, thus shows a restrictive dysfunction pattern. CSE in LBP rehabilitation have become popular due to observed changes in abdominal muscle activation patterns as well as improvement in the trunk stability. Recently Yoga is used for the treatment of LBP. It is a form of complementary and alternative medicine which includes various practices such as Asanas [Adopting physical postures], Pranayama [Breathing exercises] and meditation.

This study aimed to find whether there is any alteration in the pulmonary function in CLBP patients, if so whether this alteration is having relationship with the pain and disability in CLBP patients. This study will also analyze the effect of core stabilization and
yoga in pain, disability and pulmonary function and finally will conclude which is the superior intervention.

**MATERIAL AND METHODOLOGY:**

After informing about the objective and scope, procedures, risks and benefits of the research, all participants gave their signed written consent. Participation was voluntary and withdrawal from this study was permitted at any time. All procedures were carried out in accordance with the Declaration of Helsinki. Research was approved by the Research and Recognition as well as Ethical committee of both the university and the study center. All the patients underwent a standardized interview regarding their medical history, pain history, occupation, and duration of the symptoms. Patients suffering from low back pain for more than 3 months from the age group of 20 – 50 years are included. Both genders are included in this study. Further more in both the treatment groups, patients with history of the known pulmonary diseases such as pulmonary fibrosis, emphysema, bronchial asthma, cardiothoracic surgery, chronic bronchitis, lung cancer were excluded. We also excluded the patients with specific cause for their back pain such as spondylolisthesis, fracture spine, due to any medical condition like tumour, pregnancy; complex conditions eg., sciatica, spinal stenosis, previous spinal surgery. For this study, we also excluded the patients with medical conditions for which exercise and yoga is contraindicated like severe disc disease, major depression, also excluded the person who has unstable medical or severe psychiatric issues and dementia. Regarding the intervention those who did any kind of exercise or yoga in the previous 6 months were excluded. The study sample comprised of 216 patients with history of chronic low back pain. The subjects were matched and randomised into 2 groups as Experimental Group [EG] with n=109 and Control Group [CG] with n=107. Each group performed the assigned exercise for 30 mins, 2 sessions [Morning and Evening] every alternate day for 9 weeks. All the participants were instructed not to do any other physical exercise, other than the specified prescribed one during the study period. Outcome measures were pain intensity [11 Point Visual Analogue Scale], Disability index [Roland Morris Disability Questionnaire - RMDQ] and selected Pulmonary Function parameters - FEV₁ [Spirometer – Welch Allyn – Schiller - SP-1] and PEFR [Wright Peak Expiratory Flow Meter]. The outcomes measures were measured before intervention [Pre-test], 3 weeks
[Post-test-1], 6 weeks [Post-test-2] and 9 weeks [Post-test-3] after the interventions and recorded for statistical analysis.

**INTERVENTION:**

<table>
<thead>
<tr>
<th>GROUP</th>
<th>STAGE 1</th>
<th>STAGE 2</th>
<th>STAGE 3</th>
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<tbody>
<tr>
<td></td>
<td>2. Abdominal Draw In with knee to chest.</td>
<td>6. Quadruped Cat and Camel.</td>
<td>10. Lunges.</td>
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<tr>
<td></td>
<td>3. Abdominal controlled curls.</td>
<td>7. Quadruped Opposite arm / leg.</td>
<td>11. Front Plank.</td>
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**STATISTICAL ANALYSIS:**

The data were analyzed and Graphs plotted using SPSS 20 software package. The level of significance was set at p < 0.05. Descriptive data were presented as mean ± standard deviation (SD) for both the experimental and control group. The Kolmogorov-Smirnov test was used to examine the normality of the data and Levene’s test was used to find whether the experimental and control groups were identical. Pearson Correlation was used to identify
the correlation between the variables. ‘t’ - test was used to compare Patient FEV₁ & PEFR values with Expected FEV₁ & PEFR Values. Repeated measures one way ANOVA was used to compare within group to find out the statistical significance between time points of these variables (VAS, RMQ, PEFR and FEV₁) in both the groups having back pain. The two-way RMANOVA were used to test effects of core stabilization and yoga therapy on back pain.

RESULTS:

PHASE - 1:

- The mean patient value of 2.04 against their expected value 3.34 shows 39% reduction in the FEV1 value in patients with CLBP. Similarly in PEFR the mean patient value is 300.78 whereas the expected value is 474.28 shows 36.58% reduction. This is clinically significant decrease in the normal pulmonary function.
- The “t” value of 44.763 and 29.424 for FEV₁ and PEFR between the patient and expected value shows that the difference is statistically significant.

PHASE 2:

CORRELATION:

- Pain Vs Disability (r) = 0.796 [P < 0.01] Strong Positive
- Pain Vs FEV₁ (r) = - 0.441 [P < 0.01] Moderate Negative
- Disability Vs FEV₁ (r) = -0.430[P < 0.01] Moderate Negative
- Pain Vs PEFR (r) = - 0.314 [P < 0.01] Weak Negative
- Disability Vs PEFR (r) = -0.319 [P < 0.01] Weak Negative
- FEV₁ Vs PEFR (r) = 0.517 [P < 0.01] Moderate Positive

PHASE 3:

[Core Stabilization Exercise]

- The results show that pain [VAS score], Disability [RMDQ], FEV₁ and PEFR are affected by the amount of time since the Core Stabilization Exercise began with reference to the “F” of 3616.813, 10148.067, 2260.045 & 3416.022 respectively with p < 0.05. There is significant (P<0.05) increase in PEFR and FEV₁ and decrease in VAS and RMQ when compare with pre-test.
**Yoga Exercise (Asanas)**

- The results show that pain [VAS score], Disability [RMDQ], $\text{FEV}_1$ and PEFR are affected by the amount of time since the Yoga began with reference to the “F” of 1758.047, 10605.262, 1235.672 and 977.087 respectively with $p < 0.05$. There is significant ($P<0.05$) increase in PEFR and $\text{FEV}_1$ and decrease in VAS and RMQ when compare with pre-test.

**PHASE 4:**

- The results show that pain, disability, $\text{FEV}_1$ and PEFR are affected by the amount of time since the Core stabilization exercise and Yoga began with reference to the F value of 71.660, 103.526, 77.062 and 168.401 respectively [$p < 0.05$]. In the pairwise comparison analysis, the mean difference of pain, disability, $\text{FEV}_1$ and PEFR are 0.764, 1.320, 0.185 and 18.105 respectively showed a statistically significant difference between the interventions. Finally, Tests of Between-Subjects Effects in that when the Pre and Post tests are combined for the group’s CORE and YOGA significantly different with reference to the F values 5108.832, 8155.367, 13427.094 and 9306.028 [$P<0.05$].

**CONCLUSION:**

Among 216 CLBP patients studied, significant reduction in the pulmonary function - $\text{FEV}_1$ & PEFR. Pulmonary function parameters - $\text{FEV}_1$ and PEFR has moderate negative correlation with the pain and disability in patients with CLBP. Both core stabilization exercises and Yoga exercises [Asanas] significantly improves the $\text{FEV}_1$ and PEFR value, significantly reduces pain and disability in chronic low back pain patients. Among the 2 groups, core stabilization exercises is statistically significant than the yoga in improving the $\text{FEV}_1$ and PEFR and also in reducing the pain and disability in chronic low back pain patients.

**KEYWORDS:** Core Stabilization exercise, Yoga, Low Back Pain, PEFR, $\text{FEV}_1$