EFFICACY OF BACKSCHOOL PROGRAM VERSUS SWISS BALL EXERCISE ON PAIN AND CORE ENDURANCE IN INDIVIDUALS WITH NON-SPECIFIC LOW BACK PAIN: A COMPARATIVE STUDY.

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ABSTRACT

Aims: Non-specific low back pain affects people of all age groups and is one of the prime contributors in the list of disease globally. Management guidelines endorse triage to identify the rare cases of low back pain that are caused by medically serious pathology, and so require diagnostic work-up or specialist referral, or both. As non-specific low back pain is mostly idiopathic, treatment focuses on reducing pain and its consequences. Management consists of education and reassurance, Physical therapy, analgesic medicines, non-pharmacological therapies, and timely review. Across the globe, the prevalence is 60% to 70% in a year. Range of exercise regimes are shown in various set ups, most effective regimen is still not clear.

Study design: Comparative Study

Place and Duration of Study: Ahmedabad Institute of Medical Sciences, two years

Objective: To assess and compare the effect of back school program, core stability exercise on pain and core endurance.

Methodology: A group of 36 patients having non-specific low back pain between age groups 18-40 were randomly selected and allocated to two groups. Group A (n=16) received back school exercise whereas Swiss ball exercise was given to Group B (n=20). The subjects were treated for two weeks. Baseline data for VAS and Core Endurance were taken on day one pre-treatment and at the end of two weeks post treatment.

Result: The results were analyzed by wilcoxon signed rank test within both groups. Both groups showed significant improvement in VAS and core endurance at the end of 2weeks. Comparison between both the Group A and Group B was done by Mann- whitney U test and statistically no significant difference was seen in VAS and core endurance between the groups.

Conclusion: The study concluded that intra-group results showed significantly effective reduction in pain intensity for both the exercise regimens (Group A and Group B). Here, back school program showed no significant improvement in core endurance in subjects with non-specific low back pain whereas Swiss Ball Exercises showed improvement in core endurance. However, inter-group comparison showed no clinically significant change either in VAS or Core Endurance.

Key words: Non-Specific Low back Pain, Back school program, Core endurance, Swiss Ball Exercise regimen.

I. INTRODUCTION

Low back pain is an essential medical issue with critical outcomes from a financial perspective and is related with high costs, work non-appearance and illness.¹ It is the main source of work related injury and incapacity in both created and creating nations.² Prevalence of low back torment ranges from 12 to 33%, the one-year commonness of low back torment ranges from 22 to 65%, and the lifetime pervasiveness of low back torment ranges from 11 to 84%.¹ Various examinations in India showed predominance of low backache as 11.1% to 51%.³⁴ Despite of expenses to wellbeing in various nations, there is no uncertainty that low back pain leads to a significant monetary issue around the world. A basic and pragmatic
grouping, which has increased worldwide acknowledgment, is to isolate low back pain into three classes – alleged "analytic triage". Any Precise pathology, Nerve root involvement, indefinable underlying cause. "NSLBP is defined as a type of back pain where there is no underlying specific known spinal pathologies (such as disease, tumour, bone weakening diseases, ankylosing spondylitis, fracture, incendiary procedure, radicular disorder or cauda equine syndrome)". Acute low back pain is typically characterized as pain less than a month and half; sub-acute defined as pain between 6 to 12 weeks and chronic low back pain stands for 12 weeks or longer. Core Stability (CS) showed up in the last decade of the 1990s. The core is square shaped power house covered with roof, floor, anterior and posterior wall. All these soft-tissues are directly or indirectly connected with thoracolumbar fascia and spinal segments which connects upper and lower limb. The focal point of ongoing exploration has been on the job of the Transverses Abdominis (TrA) and multifidus muscles and their capacity as center stabilizers. Therefore during examination it was found that pain arises due to lack in the core muscles endurance. Low back pain is because of strain on the delicate structure of the spine that is because of lack in strength as well as endurance.

Endurance training plays an important role in subsiding this condition, therefore training connective tissue such as muscle for its strength. Thus such training regimen diminishes weakness & provides stability to the spinal column. Different fantasies and studies state expanded articulation. To come out from such ideas, the need rose to discover the productivity of conventional exercise and Swiss ball exercise on three key outcomes Pain, Core Endurance, and Functional Disability.

The founder of ‘Swedish back school’ was Zachrisson-Forsell. The intention of this program was to minimize the pain and prevent upcoming episodes of low back pain. This includes information on the anatomy of the back, biomechanics, optimal posture, ergonomics and back exercises. There are many professionals who are not aware about correct ergonomics and ideal posture at work place which leads to rise in total number of incidence of having low back pain.

Hypothesis:

Null Hypothesis (H0): There is no significant difference between the effects of back school program versus Swiss Ball exercises on pain intensity and core endurance in individuals with non-specific low back pain

Alternative Hypothesis (H1): There is significant difference between the effects of back school program versus Swiss Ball exercises on pain intensity and core endurance in individuals with non-specific low back pain.

II. METHODOLOGY

The study was approved by Institutional ethical committee. A comparative and randomized controlled trial was conducted. All patients were referred from Consulting Orthopaedic surgeon to Physiotherapy department.

2.1 Inclusion & Exclusion Criteria:

The subjects included age between 18-40 years genders, clinically diagnosed, suffering from (low back pain) since 3 months or more than that.

The subjects excluded Patients with Fractures, (benign) tumours (or malignancies), inflammatory disease, Nerve root compromise, known case of open or minimal invasive surgeries, deformities, cord compressions, bone weakening condition, pregnancy or underlying Cardio-respiratory illness.

2.2 SAMPLE SIZE:

It was calculated using Standard deviation (s.d. = 9.83) and difference of mean (= 30) from pilot study where each group consisted of 6 subjects at 90% of power of study. However, following number of patients were selected in to the study.

Group A: 16 patients, Group B: 20 patients

The total number of subjects were screened were 48. Out of which 41 were included in the study as 7 patients were excluded (3 subjects didn’t match the inclusion criteria and 4 subjects denied to participate in the study). Randomization was done and 19 subjects were in group A and 22 subjects were in group B. Out of 19 subjects of group, A 3 subjects didn’t complete
the study. Out of 22 subjects of group B, 2 subjects didn’t complete the study. Therefore 16 and 20 subjects were there in group A and group B respectively.

FLOW CHART

2.3 Procedure:
Subjects with NSLBP referred to physiotherapy department by expert orthopaedic specialist were screened as per their inclusion and exclusion criteria & informed written consent was taken. Outcome measures Visual Analogue Scale (VAS) and Core Endurance were measured on day 1 just before starting intervention and at the end of 2 weeks post intervention. Core Stabilizer (Chattanooga) was used to measure core endurance.

2.4 Intervention:
Subjects were instructed to continue their routine activities and not to involve themselves in other regime or sports activity. With the lottery method they were assigned in groups. Group A received Back School Program and Group B received Swiss ball exercise.

Visual Analogue Scale (VAS) is subjective tool to measure the pain where subjects were asked to estimate the pain.

For measuring core endurance Chattanooga pressure biofeedback unit was used and standard procedure described in the manual was followed.

For measuring transverses abdominal muscles endurance, the subject was made to lie prone, and the Stabilizer Pressure, Biofeedback Unit cuff, was placed horizontally under the abdomen with navel at the center of the unit. The lower edge of the cuff lies just below the anterior superior iliac spines (ASIS). The pressure cuff was inflated to 70 mmHg, and the subject was instructed to perform the drawing-in maneuver while fully relaxing the abdomen and maintaining relaxed breathing without moving the spine or pelvis If done properly, the pressure dropped by 6 to 10 mmHg.

The subject was asked to try and maintain the pressure drop (drawing in) for up to 10 seconds. A 20 sec break was given between each contraction (10sec hold).

Based on this, Performance Index was calculated, formula for the same was as below.
P.I. (Performance Index) = Number of repetition subject can perform multiplied by number of seconds the subject can sustain the contraction (in seconds).

Both the groups received acupuncture TENS for 15 minutes. It produced a modified biphasic asymmetric pulse, and it was set to a pulse width of 100 μs and a frequency of 100 Hz.

Group A exercises are as follows:

<table>
<thead>
<tr>
<th>Group A (Back school Program)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercises</td>
<td>Repetition(s)</td>
</tr>
<tr>
<td>Diaphragmatic breathing</td>
<td>10 repetitions</td>
</tr>
<tr>
<td>Stretching of erector spinae</td>
<td>10 times with 30 seconds of hold for each repetition</td>
</tr>
<tr>
<td>Stretching of anterior hip muscles</td>
<td>10 times with 30 seconds of hold</td>
</tr>
<tr>
<td>Stretching of posterior lower limb muscles</td>
<td>10 times with 30 seconds of hold</td>
</tr>
<tr>
<td>Kinesthetic training</td>
<td>10 repetition</td>
</tr>
<tr>
<td>Strengthening of Abdominals</td>
<td>10 repetition</td>
</tr>
</tbody>
</table>

Group B received balancing exercise (sitting on Swiss ball, moving it to and fro, moving it side by side) on ball initially in order to gain Subject’s confidence.

Group B exercises are as follows:

<table>
<thead>
<tr>
<th>Group B (Swiss Ball Exercise)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercises</td>
<td>Repetition(s)</td>
</tr>
<tr>
<td>Abdominal curl up exercise</td>
<td>10 times with 5 seconds of hold</td>
</tr>
<tr>
<td>Back extension exercise</td>
<td>10 times with 5 seconds of hold</td>
</tr>
<tr>
<td>Pelvic bridge</td>
<td>10 times with 5 seconds of hold</td>
</tr>
<tr>
<td>Straight leg raise</td>
<td>10 times with 5 seconds of hold</td>
</tr>
</tbody>
</table>

In second week exercise sets were increase which became two sets of exercise (10*2) with 10 seconds of hold.

Within group analysis Wilcoxon signed rank test was performed and for between group analyses Man Whitney U test was used for statistical analysis.

III. RESULTS

| Table:01 Intra Group Pre and Post Comparison of VAS |
|---|---|---|---|---|
| Groups | VAS | Mean | ±SD | Z  | P    |
| Group A | Pre | 6.30 | 0.60 | -3.05 | .002 |
|          | Post| 3.32 | 1.25 |     |     |
| Group B | Pre | 6.41 | 0.69 | -3.15 | .002 |
|          | Post| 3.40 | 0.90 |     |     |

Table 1 shows pre and post treatment values of pain calculated by Wilcoxon signed rank test within the group. Group A shows mean and SD of pre-treatment value is 6.30 and ± 0.60 respectively and of post treatment value shows mean and SD is 3.32 and ±1.25 respectively with Z value -3.05 and P value .002. Group B shows mean and SD of pre-treatment value is 6.41 and ±0.69 respectively while post treatment value shows mean and SD of 3.40 and ±0.90 respectively with Z value -3.15 and P value .002. This shows that both the groups have significant improvement in reducing pain.
Comparing core endurance taken after 2 weeks of the treatment, in group A (z value=-3.13 and P value=.002). Group B shows mean and SD of pre-treatment value is 19.13 and ±0.60 respectively while post treatment value shows mean and SD of 42.35 and ±14.40 respectively with Z value 3.16 and P value .05. This shows that Group A is having significant improvement whereas Group B having no significant improvement in core endurance.

Here, the data was not normally distributed. Hence, Man Whitney U test was used for analysis. In Table: 3, P value of VAS and Core Endurance are 1.00 and 0.068 respectively. This shows no significant difference between two groups.

### IV. DISCUSSION

The findings of this study showed that participants had significant reduction in pain and incremental progress was noted in the endurance of soft-tissues of lumbar musculature. Group A subjects were given back school regimen while Group B subjects were given Swiss ball exercises and both the groups were given TENS.

Comparing VAS measures taken after 2 weeks of the treatment, in group A (z-value=-3.05, p-value=.002), it showed a statistically significant improvement. This result was supported by the previous studies showing improvement in the pain after Backschool intervention. LOP Costa et al (2013) found that after 1 month of intervention, Backschool was effective in reducing the pain in chronic non-specific low back pain. The follow-up was also taken at 3 and 6 months, which showed that there is mild effectiveness at the long term. Training given by the back school programme may reduce subjects’ fear-avoidance behavior, developed due to incorrect interpretation of pain.18

The present study also showed a decrease in VAS in group B (z=-3.15, P=.002) which is supported by the study done by Joo Soo Yoon et al (2013) supports the present result which concluded that exercising on ball is evidently proving that it decreases pain. That could be because of comprehensively improving muscle strength, endurance, balance, and flexibility of the trunk and the reflexes, cognitive sense, balance, and proprioceptive sense while the individual does exercises on ball.16

In the study of Kang et al (2012) concluded that there is significant improvement in VAS compare to other group. The result verifies the theory that the use of Swiss ball may increase the activation of global and local trunk muscles during bridging exercises in the supine and prone positions which helps in reducing low back pain and improves muscles strength and core endurance.13

Comparing core endurance taken after 2 weeks of the treatment, in group A (z-value=-3.13, P-Value=.002), showed no statistically significant improvement. This could be because exercise regimen alone does not activate core muscles effectively. In addition to this, muscles specific exercise training is also required which is lacking in the Back school program.

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**Table:02 Intra Group Pre and Post Comparison of Core Endurance**

<table>
<thead>
<tr>
<th>Groups</th>
<th>Core Endurance</th>
<th>Mean ±SD</th>
<th>Z</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>Pre</td>
<td>28.45 ± 21.18</td>
<td>-3.13</td>
<td>.002</td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td>54.30 ± 18.84</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group B</td>
<td>Pre</td>
<td>19.13 ± 06.80</td>
<td>-3.16</td>
<td>.05</td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td>42.35 ± 14.40</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table:03 Inter Group difference between two outcome measures**

<table>
<thead>
<tr>
<th>Outcome Measure</th>
<th>Group A MEAN ±SD</th>
<th>Group B MEAN ±SD</th>
<th>U-Value</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>VAS</td>
<td>3.29 ±1.10</td>
<td>3.28 ±1.18</td>
<td>66.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Core Endurance</td>
<td>22.5 ±6.12</td>
<td>27.3 ±6.19</td>
<td>33.00</td>
<td>0.068</td>
</tr>
</tbody>
</table>

The data was not normally distributed. Hence, Mann Whitney U test was used for analysis. In Table: 3, P value of VAS and Core Endurance are 1.00 and 0.068 respectively. This shows no significant difference between two groups.
Comparing core endurance taken after 2 weeks of the treatment, in group B (z-value= -3.14, P-value=.002), showed a statistically significant improvement.

A previous study done by Chaurasiya et al 2012 supported the fact that exercises with swiss ball are effective in improving trunk endurance at the end of 5 weeks of endurance training. This is because performing abdominal and back exercises on unstable surfaces stressed the musculature and activated the neuroadaptive mechanisms that led to the early phase gains in stability and proprioreceptor activity.17

V. CONCLUSION

The study concluded that Back School regimen and Swiss ball exercise both played key role in reducing intensity of pain (as per intra group regimen results) whereas core endurance is significantly enhanced only in the Swiss ball exercise regimen but not in the back school program. However, inter group comparison shows no clinically significant change in VAS or Core Endurance in Group A or Group B. Thus null hypothesis is accepted.

REFERENCES


ABBREVIATIONS

NSLBP: Non Specific Low Back Pain,
VAS: Visual Analog Scale,
TENS: Transcutaneous Electrical Nerve Stimulation,
P.I.: Performance Index,
ASIS : Anterior Superior Iliac Spines

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