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Association Of Balance And Lumbar Proprioception With Quality Of Life And Fear Of Fall In Subjects With Chronic Non-Specific Low Back Pain : A Correlational Study

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ABSTRACT

INTRODUCTION-Chronic non-specific low back pain (CNSLBP) brought on by acute or chronic lumbar diseases can affect the way the body is built and how it moves and functions, resulting in decreased mobility, endurance, and muscle strength. CNSLBP can affect balance and proprioception which eventually can have a huge impact on quality of life as well as fear of fall in the patients. So, it is necessary to assess these components in patients having chronic non-specific low back pain using appropriate method.

AIMS AND OBJECTIVES: To determine the association of balance and lumbar proprioception with quality of life and fear of fall in patients with chronic non-specific low back pain.

METHODOLOGY: In the present correlational study, total 46 patients with chronic non-specific low back pain with age between 20-45 years were included. Sample size calculated was 42, with a drop out chances of 10%, the total sample size was 46. Patients were evaluated for static balance (EO and EC), anticipatory balance and dynamic balance using Unipedal Stance Test (UPST), Functional Reach Test (FRT) and Five Times Sit To Stand Test (FTSTS Test) respectively. Lumbar proprioception was assessed by Joint Repositioning Error method (JRE). Quality of life and fear of fall were assessed using 12- item Short Form Survey questionnaire and Fall Efficacy Scale- International (FES - I) questionnaire respectively. Statistical analysis was done by using SPSS 26.0 version. Significance level was set at $p \leq 0.05$.

RESULT: The study was conducted on 46 subjects with 23 male and 23 female having chronic non-specific low back pain. The data were ensured for their normal distribution using the Shapiro-Wilk Test. Pearson Correlation test as the parametric test was performed to see the relationship between all the variables and it showed that there were significant correlation i.e. either negative or positive correlation present between all the variables. There was a positive correlation present between balance and quality of life as well as with fear of fall. Whereas, there was a negative correlation present between lumbar proprioception with quality of life but positive correlation with fear of fall.

CONCLUSION: So, study concluded that there was significant association found between balance with quality of life and fear of fall, signifying more the balance score less will be the fear of fall and improved quality of life. Also, lumbar proprioception was associated with quality of life and fear of fall showing that less the pelvic tilt, less there will be the risk of fall and hence, improved quality of life.

Key words; chronic non-specific lbp, lumbar proprioception, quality of life

INTRODUCTION

Over 50% of elderly people experience musculoskeletal pain, with low back pain being the most prevalent type, which up to According to the World Health Organization, “Low back pain is the most common musculoskeletal condition, affecting 4 to 33% of the population at any given time and affecting almost everyone at some point.” Low back pain is the second most common affliction of mankind after common cold¹. 80% of people experience at least once in their life.² Among these, approximately 85-95% of the LBP cases have no known cause or pathology & so they can be classified as non-specific LBP (NSLBP).³ It has been proposed that chronic LBP is associated with lower results on balance tests. Many investigations have shown that stance and equilibrium may be debilitated in patients with ongoing LBP because of deterioration of capability and coordination of the lumbar adjustment muscles and lower appendage muscles as well as changes in the construction and capability of different mind locales. Balance can be categorized into static, dynamic and anticipatory which can be assessed subjectively by Unipedal Stance Test (UPST)⁴, Five Times Sit To Stand (FTSTS) Test and the Functional Reach Test (FRT) respectively.⁵

Proprioception is “the sense of position and movement of one’s own limbs and body without using vision.”⁵ It has been demonstrated that LBP patients exhibit impaired trunk proprioception on a behavioral level when compared to people who were pain-free, people with chronic LBP had significantly higher rates of trunk repositioning errors during flexion of the back and had lower acuity for detecting changes in trunk position. Conscious trunk proprioception can be objectively evaluated by assessing the accuracy in repositioning of the trunk to a predetermined target position.² CNSLBP influences the entire individual, his/her actual wellbeing, mental prosperity, and psychosocial issues, and it carries with it a future loaded up with discouragement, despairing, sadness, dejection, a deficiency of personality, and a bad quality of life. 12-item Short Form Survey (SF-12) is considered to be the most valid and reliable tool.

The prevalence of Fear of Fall varies between 21% and 85% and is defined as “low perceived self-efficacy at avoiding falls during essential, non-hazardous activities of daily living”.⁷ F all efficacy scale is widely used for measurement of fear of fall. As in previous studies, association between balance, proprioception, quality of life and fear of fall have not been evaluated in patients with chronic non-specific LBP, hence, the need of this study is to examine – (1) the balance control in chronic low back pain patients; (2) whether proprioception impairments are related with LBP; (3) the status of quality of life in non-specific LBP patients & (4) the association between balance & lumbar proprioception with quality of life & fear of fall in patients with chronic non-specific low back pain patients.

Aim and objectives- To assess the balance control, lumbar proprioception, status of quality of life and level of fear of fall in patients with chronic non-specific low back pain. To find the association of balance and lumbar proprioception with quality of life and fear of fall in subjects with chronic non-specific low back pain.

Null hypothesis states that There is no significant association of balance and lumbar proprioception with quality of life and fear of fall in subjects with chronic non-specific low back pain.

Study design – Correlational study, study population – subjects with chronic non-specific LBP with 20-45 years of age group .sampling technique – purposive sampling study duration – 1-year .sample size - the sample size was calculated using G power software version 3.1.9.4. with effect size 0.50, $\alpha=0.05$ and power 0.95,the sample size was 42. considering 10% dropout total sample size for this study was 46. Study setting - SPB physiotherapy college OPD and other physiotherapy OPDS of Surat.

Inclusion criteria

Patients willing to participate in the study were included if they met the following criteria:20-45 years of age group, Both male & female, LBP subjects referred to the physiotherapy department by any physician or orthopedic surgeon., Subjects having non-specific low back pain for more than 3 months. NSLBP experienced between L1 & gluteal fold without radiating to lower limb.²⁶ Patients receiving physiotherapy treatment or any medications for low back pain were also included.

Exclusion criteria-Subjects having lower limb radiculopathy., Subjects having LBP due to conditions like spinal stenosis, spondylolisthesis, ankylosing spondylosis, scoliosis, Coccydynia, PIVD, etc. Subjects having history of dorso-lumbar spinal surgery within past 6 months. Post partum LBP subjects will be excluded. ,Subjects having neurological disorders with history of present symptoms of impairment of balance & fall will be excluded.

MATERIAL AND TOOLS :LASER pointer ,Tripod stand ,Measuring Tape ,Stop watch ,Chair⁵,SF-12 Questionnaire, Fall Efficacy Scale – International

PROCEDURE- The patients were screened on the basis of inclusion and exclusion criteria and their demographic data was taken by an assessment performa. Prior to the commencement of the study, detailed procedure of the study was explained to the patients and a signed informed consent form was taken from them.

OUTCOME MEASURES : Balance in which static, anticipatory & dynamic balance were assessed through the Unipedal Stance Test (UPST)⁸, the Functional Reach Test (FRT) & the Five Times Sit To Stand (FTSTS) test respectively.⁵Lumbar proprioception was assessed through the joint repositioning error method.⁵Quality of life was assessed through the 12-item Short Form Survey (SF-12).⁶Fear of fall was assessed through the Fall Efficacy Scale – International (FES-I).¹⁴

Assessment of balance- Static, anticipatory & dynamic balance was assessed with the Unipedal Stance Test (UPST)⁴, the FRT & the FTSTS respectively³. In unipedal stance test (UPST), prior to the test the subject was asked to kick a ball placed on the floor in front of him/her and the kicking limb will be recorded as the 'dominant' limb. The subject was asked to stand barefoot on their dominant limb, with the other limb raised so that the raised foot was near but not touching the ankle of their stance limb. Each subject was asked to focus on a spot on the wall at eye level in front of him, for the duration of the eyes open test. Prior to raising the limb, the subject was instructed to cross his/her arms over the chest. A stopwatch was used to measure the amount of time the subject was able to stand on one limb. Time was commenced when the subject raised the foot off the floor. Time was ended when the subject either: (1) used his/her arms (i.e., uncross arms), (2) used the raised foot (moves it toward or away from the standing limb or touches the floor), (3) moved the weight-bearing foot to maintain his/her balance (i.e., rotates foot on the ground), (4) a maximum of 45 seconds were elapsed, or (5) opened eyes on eyes closed trials. At least 5 minutes of rest was allowed between each trial set to avoid fatigue. The reliability for the test is ICC=0.994 for eyes open & ICC=0.998 for eyes close.⁴ In order to measure anticipatory balance control, functional reach test (FRT) was performed in which each participant was standing beside a wall and instructed to reach forward, perpendicular to the wall, with their shoulders flexed at 90° and with their elbows extended. From the location of the third metacarpal along the horizontal axis, a measuring tape was used to measure the distance from the starting point to the reach point.³

In the five times sit to stand test (FTSTS), dynamic balance control and functional change of transitional movements was assessed. Each subject crossed their arms over their chests while sitting on a standard chair with their legs supported. Time began when the assessor said "go" and ended when the subject's buttocks touched the chair after the fifth repetition.³ Tests of interrater reliability were conducted on 10 patients with subacute NSLBP for balance and proprioceptive senses. These tests were extremely reliable [intraclass correlation coefficient (ICC): 0.92–1].³

Evaluation of lumbar proprioception-The method which was used to assess the lumbar proprioception is the joint repositioning error. The examiner directed the lumbar spine to a neutral position (hips 90° and knees 90°) by asking each participant to sit with their feet supported and their arms on their thighs. The lumbosacral region was measured with a 10-cm tape measure with mm markings, with the centre marker (5 cm) on sacral segment 1 (S1) as the starting point. A laser pointer was set up on a tripod stand at a distance of 50 cm from the patient's stool, adjusted to be levelled, and aimed at the starting location. The participant was told to recall the target position (neutral), travel from the maximum anterior tilt to the maximum posterior tilt twice, maintaining each position for 5 seconds each time, and then return to the neutral target position. Using the laser line on the tape measure, the deviation from the starting point was measured in cm.³ Also the deviation to the side to side from the starting point was measured. Before the assessment, the participants were made to rehearse the repositioning test twice and 3 test trials was given and the average score of 3 trials were recorded.³ The reliability for the test is ICC = 0.90¹⁵ which can be considered appropriate measurement for the evaluation of lumbar proprioception in patients with chronic non-specific LBP.

Evaluation of quality of life- Quality of life was assessed using 12-item Short Form Survey (SF-12).⁶ The SF-12 is a 12 item questionnaire that assesses how health affects a person's daily life. It consists of 8 domains which measures physical functioning, role limitations due to physical problems, bodily pain, general health, vitality, social functioning, role limitations due to emotional problems, and mental health. The scale was administered by the interview method to the patients by the examiner.⁹ The scoring was done through an online software named SF-12 -- Orthotoolkit.¹⁰ The internal consistency for physical component summary (PCS) & mental component summary (MCS) are $\alpha = 0.73$ & $\alpha = 0.78$ whereas the test – retest reliability are ICC = 0.79 & ICC = 0.85 respectively which is said to be appropriate measurement for the evaluation of quality of life in patients with chronic non-specific LBP.¹¹

Evaluation of fear of fall- The fear of fall was assessed using the Fall Efficacy Scale–International (FES – I). It is a 16 item questionnaire with a score ranging from minimum 16 (no concern about falling) to maximum 64 (severe concern about falling). It evaluates a wide range of physical, social, and functional aspects related with concerns about falling.⁷ It was administered to the patients by the interview method. Some recent studies have shown good internal consistency & test-retest reliability ($\alpha = 0.96$ & ICC = 0.96)³⁰ of the scale and so it is appropriate measurement for the evaluation of fear of fall in patients with chronic non-specific LBP.¹²



Depicts evaluation of Static, Anticipatory Dynamic Balance using UPST



EVALUATION OF LUMBAR PROPRIOCEPTION

SATISTICAL ANALYSIS AND RESULT-

The Statistical software named statistical package of social sciences (SPSS) version 26 (SPSS 20.0) was used for the analysis of the data and Microsoft word 2013 and Excel 2013 was used to generate graphs and tables. Descriptive statistical analysis was carried out at 95% confidence interval. Outcome measurements analyzed were presented as mean \pm SD. Significance was assessed at 5 % level of significance with $p \leq 0.05$. Total sample size analyzed was 46, since there were no drop outs, data was analyzed for 46 patients. The data were ensured for their normal distribution using Shapiro-Wilk Test. From most variables followed the normal as p value ≤ 0.05 . So, the parametric tests of correlation i.e. Pearson correlation was performed to see the relationship between all the variables.

RESULT-

| VARIABLES | MEAN | S.D |
|----------------------|---------|---------|
| AGE | 35.28 | 6.524 |
| STATICBALANCEEO | 27.5541 | 8.80318 |
| STATICBALANCEEC | 16.1839 | 8.29985 |
| ANTICIPATORY BALANCE | 35.7402 | 5.82443 |
| DYNAMIC BALANCE | 20.9004 | 5.25385 |
| APPELVICTILT | .4652 | .39283 |
| SIDEPELVICTILT | .2870 | .28953 |
| PCSQOL | 41.0863 | 7.11034 |
| MCSQOL | 44.5054 | 7.58663 |
| FEAROFFALL | 23.26 | 5.040 |

Table 1 Demographic variables

| | | PCSQOL | MCSQOL |
|-----------------|---------------------|--------|--------|
| STATICBALANCEEO | Pearson Correlation | -.091 | -.127 |
| | Sig. (2-tailed) | .686 | .575 |
| | N | 22 | 22 |

Table 2 Depicts negative correlation between Static balance EO and PCSQOL & MCSQOL

| | | PCSQOL | MCSQOL |
|-----------------|---------------------|--------|--------|
| STATICBALANCEEC | Pearson Correlation | -.207 | -.010 |
| | Sig. (2-tailed) | .355 | .966 |
| | N | 22 | 22 |

Table 3 Depicts negative correlation between Static balance EC and PCSQOL & MCSQOL

| | | PCSQOL | MCSQOL |
|---------------------|---------------------|--------|--------|
| ANTICIPATORYBALANCE | Pearson Correlation | .342* | .374* |
| | Sig. (2-tailed) | .020 | .010 |
| | N | 46 | 46 |
| DYNAMICBALANCE | Pearson Correlation | .020 | -.006 |
| | Sig. (2-tailed) | .896 | .966 |
| | N | 46 | 46 |

| | | |
|---------------------|---------------------|-----------------------|
| ANTICIPATORYBALANCE | Pearson correlation | FEAROFFALL -.561** |
| | p value | .000 |
| | N | 46 |

TABLE 4 Depicts correlation between Anticipatory balance and PCSQOL & MCSQOL, correlation between Dynamic balance and PCSQOL & MCSQOL

| | | |
|-----------------|---------------------|------------|
| | | FEAROFFALL |
| STATICBALANCEEO | Pearson Correlation | .054 |
| | p value | .813 |
| | N | 46 |

| | | |
|-----------------|---------------------|---------------------|
| | | FEAROFFALL |
| DYNAMICBALANCE | Pearson correlation | FEAROFFALL -.209 |
| STATICBALANCEEC | Pearson Correlation | -.022 |
| | p value | .163 |
| | p value | .924 |
| | N | 46 |

TABLE 5 Depicts positive correlation between Static balance EO and FEAR OF FALL

| | | | |
|-----------------|---------------------|--------|--------|
| | | PCSQOL | MCSQOL |
| AP PELVICTILT | Pearson Correlation | -.022 | .137 |
| | Sig. (2-tailed) | .886 | .365 |
| | N | 46 | 46 |
| SIDE PELVICTILT | Pearson Correlation | -.175 | -.034 |
| | Sig. (2-tailed) | .244 | .822 |
| | N | 46 | 46 |

TABLE 6 Depicts negative correlation between Static balance EC and FEAR OF FALL

Table 7 Depicts Negative correlation between Anticipatory balance and FEAR OF FALL

Table8 Depicts POSITIVE correlation between Dynamic balance and Fear of Fall

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| | | |
|----------------|---------------------|------------|
| | | FEAROFFALL |
| A/P PELVICTILT | Pearson Correlation | .312* |
| | Sig. (2-tailed) | .035 |
| | N | 46 |

TABLE 10. Depicts POSITIVE correlation between AP PELVIC TILT and FEAR OF FALL

| | | FEAR OF FALL |
|-----------------|---------------------|--------------|
| S/S PELVIC TILT | Pearson Correlation | .351* |
| | Sig. (2-tailed) | .017* |
| | N | 46 |

Table 11. Depicts POSITIVE correlation between SIDE PELVIC TILT and FEAR OF FALL

DISCUSSION-This study was conducted on 46 subjects with age group 20-45 years according to the inclusion criteria. The mean age group was 35.28 years with 50% male and 50% female subjects. The variables which were taken for analysis were age, static balance (EO), static balance (EC), anticipatory balance, dynamic balance, anterior/posterior pelvic tilt, side to side pelvic tilt, physical component score and mental component score of SF-12 and fear of fall. Our findings observed that there is no major association of static balance with quality of life. Negative correlation was present between static balance EC with quality of life (PCSQOL & MCSQOL). However, Positive correlation was found between Anticipatory balance and PCSQOL & MCSQOL. Also positive correlation was found between Dynamic balance and PCSQOL. These findings were supported in some studies, where, it has been concluded that the score for quality of life were significantly lower in patients with NSLBP than those with mild-to-moderate pain.¹³ Moreover, in the present study, it has been seen that anticipatory balance and dynamic balance is associated with quality of life which is statistically significant.

There was a similar study in which Su Su Hlaing et al., assessed the anticipatory balance using functional reach test in subacute non-specific LBP (NSLBP) patients and showed the association of anticipatory balance with NSLBP.⁷

In the present study, significant association was found between the balance and fear of fall in patients with chronic non-specific low back pain. Positive correlation was found between Static balance EO and Fear of Fall. However, negative correlation was found between Static balance EC and Fear of Fall. Also, significant negative correlation was found between Anticipatory balance and Fear of Fall and there was positive correlation between dynamic balance and Fear of Fall. There are some studies which found positive correlation between anticipatory balance and fear of fall a.

In the present study, it was seen that there was negative correlation found between anterior/posterior pelvic and PCSQOL, whereas positive correlation was found with MCSQOL. There was negative correlation present between side to side pelvic tilt and quality of life (PCSQOL and MCSQOL). QOL Also they have said that because proprioception relies heavily on myofascia, restriction of myofascia may inhibit proprioception and impair lumbar function.¹⁴

Our study results are in accordance with the study conducted by Mohammad A. ALMohiza et al., in which they concluded that CLBP patients had less proprioception than asymptomatic people, and previous studies have shown that this group falls more frequently.⁸ These findings support the findings of other studies that have suggested that people with CLBP fall more frequently and that kinesiophobia can make CLBP patients more prone to balance issues. Decreased proprioception is directly linked to an increased risk of falling as it was also found in our study. The question of whether local dysfunction of proprioceptors affects the quality or quantity of sensory reception or changes in the central processing of proprioceptive signals is relevant to the mechanism of lumbar proprioceptive change. The paraspinal

muscles' muscle spindles are more sensitive to position and movement than arm and leg muscles' spindles as well as they are higher in lumbar region than in the other regions because of the muscle bulk in the lumbar area. However, the mechanism by which patients with LBP experience a decrease in their sense of position and movement has not been determined.⁹

CONCLUSION- According to this study, there was significant association found between balance and quality of life except for the static balance (EO and EC) in patients with CNSLBP. Moreover, there was association found between static balance (EO) and dynamic balance with fear of fall but was not found with static balance (EC) as well as with anticipatory balance. There was no association was found between anterior/posterior pelvic tilt with PCSQOL but it was significantly associated with MCSQOL, whereas side to side pelvic had no any association with fear of fall. There was a significant association found between proprioception with fear of fall in chronic non-specific low back pain patients.

LIMITATIONS:

Following limitations should be considered when designing future study. This study included only 46 participants which is comparatively less. The measures of other clinical variables such as pain, disability and kinesiophobia were not evaluated.

FUTURE SCOPE OF THE STUDY:

A study evaluating clinical outcomes such as pain, disability, kinesiophobia and postural sway can be done to see their association with chronic non-specific low back pain. A randomized controlled trial study can be done to see the effectiveness of any specific intervention on these clinical outcomes so that it can be useful in clinical practice. Moreover, this study can be carried out on a particular occupation also in which there is non-specific low back pain is usually seen. In the present study, only patients with chronic non-specific low back pain were taken, whereas it can also be done on a specific population having any pathological low back pain.

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