The correlation of clinical status and imaging findings in patients with chronic low back pain

Nurten Nas Kirdar 1, Korhan Barış Bayram 2

1 Denizli State Hospital, Department of Physical Medicine and Rehabilitation, Denizli, Turkey
2 Izmir Katip Celebi University Faculty of Medicine, Department of Physical Medicine And Rehabilitation, Izmir, Turkey

Abstract

Background/Aim: Chronic low back pain (LBP) is a common health problem that negatively affects quality of life. A multidisciplinary approach is recommended in treating chronic LBP. In the literature, we could not find any study examining the relationship between clinical status, activities of daily living, angular measurements in the lumbar region, and spondylosis level in patients with LBP. We aimed to reveal whether there is a relationship between the severity of the clinical condition and these angular measurements. In addition, there are opposing views in the literature about the relationship between obesity and LBP, and we planned to investigate this issue in our study. We aimed to investigate the correlation between clinical, functional evaluations, and radiographic findings in patients with chronic LBP and examine the relationship between these variables and gender and educational level. We also determine the effects of age, body mass index (BMI), and waist circumference on these variables.

Methods: The research was designed as a cross-sectional, uncontrolled study. Seventy patients aged 18–65 years with chronic LBP and VAS (Visual Analog Scale) values ≥ 3 were included. Patients were grouped by gender and educational level. Lumbar lordosis angle (LLA), sacral inclination angle (SIA), and Kellgren-Lawrence (K-L) grade were recorded. VAS, Oswestry Disability Index (ODI), and Katz Activities of Daily Living (Katz-ADL) scores were calculated. Pearson correlation analysis determined the normal distribution status of the variables. Spearman’s correlation analysis evaluated the linear relationship between ODI and BPFS and LLA and SIA continuous variables. A p-value of < 0.05 was considered statistically significant.

Results: A total of 70 patients (47 females and 23 males) with chronic LBP were included in the study. Mean BMI (28.2 ± 6.1 kg/m²) and waist circumference (95.7 ± 12.7 cm) of the patients were above normal ranges (normal BMI: 18.5–24.99 kg/m², normal waist circumference: < 80 cm for women, < 90 cm for men). Katz-ADL (P = 0.006) and BPFS scores (P = 0.027) were lower, and LLA (P = 0.042) was higher in women than men. The BPFS score was lower in the low-level education group than in the high-level education group (P = 0.004). There was a positive correlation between age and SIA (P = 0.028, r = 0.262), and between age and K-L grade (P < 0.001, r = 0.633). A positive correlation was also observed between BMI and K-L grade (P = 0.001, r = 0.395) and waist circumference and K-L grade (P < 0.001, r = 0.442).

Conclusion: No correlation was found between functional clinical scales and radiographic findings in patients with chronic LBP. Increasing age, BMI, and waist circumference were associated with more severe radiographic osteoarthritis of the lumbar spine, whereas female gender and low educational level were related to lower functional levels. Further extensive studies, including a larger number of patients, are needed to clarify our results.

Keywords: Low back pain, Lumbar lordosis, Lumbar spondylosis, Obesity
Introduction

Low back pain (LBP) is defined as pain, muscle tension, and stiffness, with or without leg pain, in the area between the lower edge of the 12th rib and the lower gluteal fold at the proximal thigh [1].

The biomechanics of the lumbar spine is crucial in LBP cases. Various studies have investigated the relationship between changes in the angle of the lumbar spine and back pain [2, 3]. A previous study examined the lumbar lordosis angle (LLA), sacral inclination angle (SIA), lumbosacral angle (LSA), and sacral horizontal angle (SHA) in acute and chronic LBP patients, as well as the correlation between spinal stability and these angles [3]. Some studies show that specific exercise programs affect these angular measurements [4, 5].

Therefore, this study aimed to investigate the correlation between LLA, SIA, osteoarthritis level of the lumbar region, and functional clinical scales in chronic LBP patients. Secondary outcomes were the relationship between gender and educational level with functional clinical scales and radiographic findings and the effects of waist circumference, body mass index (BMI), and age parameters on these variables. Especially the emergence of this relationship will guide us in our treatment decision. If a significant relationship was detected between the severity of the patient’s clinical condition and angular measurements, it would have been useful to give specific exercises to improve these angles (LLA, SIA). On the other hand, if the increases in BMI and waist circumference made the clinical condition worse, weight control or the prevention of obesity would be more critical for these patients.

Materials and methods

The study was single-centered, clinical, uncontrolled, and cross-sectional. Participants were informed about the study, and their written informed consent was obtained. The protocol was performed per the ethical standards in the 1964 Helsinki Declaration and approved by the Izmir Katip Celebi University Clinical research ethics committee (approval date: 27/09/2018, approval number: 108).

Participants

The sample size was calculated with the NCSS/PASS program. Using the data of a previous study [6], it was predicted that the correlation between the lumbar lordosis angle in the extension position and the Sacral inclination angle in individuals with chronic LBP would be \( r = 0.40 \), reaching at least 61 people for 90% power, type 1 error level: 5% (2-way).

This study included 70 patients admitted to the Physical Medicine and Rehabilitation outpatient clinics of Izmir Katip Celebi University Ataturk Education and Research Hospital between October 2018 and February 2019. Inclusion criteria were the subjects aged between 18–65 years, the duration of LBP > 12 weeks, and the VAS value \( \geq 3 \). Exclusion criteria were a history of trauma, malignancy, uncontrolled endocrine disorders, fibromyalgia syndrome, inflammatory rheumatic diseases, acquired or congenital malformations (spondyloolisthesis, spondylolysis), inflammatory rheumatic diseases, previous spinal surgery, disc pathologies that cause radicular symptoms and neurological deficits, and pregnancy.

Study design

The patients were grouped according to gender and educational level. There were three groups according to educational level (illiterate/primary school, high school, and university graduates). Radiographic measurements were measured by two different doctors at different times and averaged. Questionnaires were also given to the patient and asked to fill in. Regardless of the groups, the relationships between functional clinical scales and radiographic findings of the patients were evaluated, and the effects of BMI, waist circumference, and age on these variables were determined. Then, it was investigated whether there was any difference between groups regarding functional clinical scales and radiographic findings.

Assessment methods

1. Demographic information: The patients’ age, BMI, waist circumference, marital status, educational level, and socioeconomic level were recorded.
3. Functional Level Measurement: Oswestry Disability Index, Back Pain Functional Scale, and Katz Activities of Daily Living Scales were used to evaluate functional level. Validity and reliability studies of these scales for Turkish society have been conducted [7-9].
4. Radiographic evaluation of the spine: 2-view lumbosacral spine radiographs were used to measure the lumbar lordosis angle, sacral inclination angle, and Kellgren-Lawrence classification grade. These measurement methods have also been used in similar studies [10, 11].

Statistical analysis

Statistical analysis was performed with the SPSS (Statistical Package for Social Sciences) 21.0 program. The number, percentage, mean, and standard deviation values were calculated in descriptive analyses.

Pearson correlation analysis determined the normal distribution status of the variables. Statistical analysis of independent Sample t-test, Mann Whitney U, and Kruskal Wallis H (post hoc Bonferroni corrected Mann Whitney U) tests were performed comparing two groups’ regular variables according to their suitability for normal distribution. T-test determined whether the difference between the mean values of the two groups was significant, and the F (ANOVA- Analysis of Variance) test whether the difference between the mean values of more than two groups was significant.

Spearman correlation analysis evaluated the linear relationship between ODI and BPFS and LLA and SIA continuous variables [12]. The correlation was accepted as very weak when the correlation coefficient (\( r \)) was \( < 0.3 \), weak when \( r = 0.3–0.5 \), moderate when \( r = 0.5–0.7 \), and strong when \( r > 0.7 \). A P-value of \( < 0.05 \) was considered statistically significant.

Results

A total of 70 patients (47 females and 23 males) with chronic LBP were included in the study. The sociodemographic characteristics of the patients are presented in Table 1.

Mean VAS, ODI, Katz ADL, BPFS, LLA, SIA, and Kellgren-Lawrence grades of the patients are shown in Table 2.
The patients were grouped by gender, and it was investigated whether there was any difference between both groups’ functional clinical scales and radiographic findings (Table 3). When comparing the groups according to educational levels, the BPFS score was significantly lower in the Illiterate/Primary school group than in the High school and University groups (P = 0.004) (Table 4).

The relationship between the functional clinical scales and radiographic measurements of the patients is presented in Table 5, and no correlation was found between these variables. The relationships between age, BMI, and waist circumference and functional and radiographic measurements are shown in Table 6.

Discussion

This study aimed to investigate whether there was any correlation between functional clinical scales and radiographic findings in patients with chronic LBP. However, we could not find any correlation in-between.

Ayyat et al. [13] investigated the risk factors that trigger LBP by examining patients’ characteristics, such as age, gender, marital status, occupation, educational levels, smoking, and alcohol consumption. This study reported significant correlations between low educational level, low economic level, heavy work, and smoking with LBP but did not find any correlation between LBP and gender. Similarly, we found that BPFS scores were significantly lower for those with lower educational attainment. However, in our study, the Katz ADL Scale and BPFS scores were significantly lower in women than men.

Our results showed that the mean values of BMI and waist circumference of the patients were higher than normal values for both genders (normal BMI: 18.5–24.99 kg/m², normal waist circumference: <80 cm for women, <90 cm for men) [14]. The relationship between obesity and LBP has been investigated in many other studies. A study investigating pain localization, the most prevalent age group, and the frequency of physical therapy sessions in obese and non-obese subjects with LBP showed that obesity and age had no direct influence on back pain, but they could prolong healing [15]. Chowdury et al. [16] found a direct association between BMI and LBP severity in another study. In addition, our study found that osteoarthritis grade was positively correlated with waist circumference and BMI values.

Among radiographic measurements, we found that LLA was higher in women than men, concordant with the literature [6]. The mean LLA of patients in our study was 35.8 (10.3), significantly below the normal range showing a decrease in lumbar lordosis. In this regard, the study of Murray et al. [17], in which they evaluated 301 patients, reported that both hypolordosis and hyperlordosis in both genders were correlated with degenerative joint disease.

Amonoo-Kuofi [6] reported that SIA increases in men, concordant with the literature. The mean LLA of patients in our study was 24.99 kg/m², normal waist circumference: <80 cm for women, <90 cm for men) [14]. The relationship between obesity and LBP has been investigated in many other studies. A study investigating pain localization, the most prevalent age group, and the frequency of physical therapy sessions in obese and non-obese subjects with LBP showed that obesity and age had no direct influence on back pain, but they could prolong healing [15]. Chowdury et al. [16] found a direct association between BMI and LBP severity in another study. In addition, our study found that osteoarthritis grade was positively correlated with waist circumference and BMI values.

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Amonoo-Kuofi [6] reported that SIA increases in men and decreases in women towards the end of the second decade, but between the 3rd and 5th decades, it increases in women and increases after a brief decrease in men. A decline in SIA was noted in both genders after the fifth decade. However, a weak positive correlation was found between age and SIA in both genders in our study. Another variable that increased with age was Kellgren-Lawrence grade of lumbar vertebrae, and a moderate positive correlation was found in-between. Different views have been reported on this issue in the literature. The positive correlation between age and osteoarthritis level, which is
the more common opinion, was supported by the results of our study.

The study of Ashraf et al. [11], in which they assessed 150 patients, noted a correlation between Kellgren-Lawrence level and ODI in female patients. In our study, we could not find any correlation between Kellgren-Lawrence grade and functional clinical scales, including ODI.

There are some limitations of this study. A major limitation is the lack of a control group. Second is the relatively small number of participants.

Conclusion
To conclude, in this study, we revealed that obesity is associated with both LBP and the level of spondylosis in the lumbar region. We would like to emphasize the importance of lifestyle changes and weight control in treating chronic LBP.

References

The National Library of Medicine (NLM) citation style guide has been used in this paper.