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

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Ethics Committee Approval
The study protocol was approved by the Izmir Katip Celebi University clinical research ethics committee (approval date: 27/09/2018, approval number: 108).
All procedures in this study involving human participants were performed in accordance with the 1964 Helsinki Declaration and its later amendments.

Conflict of Interest
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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), Back Pain Functional Scale (BPFS), 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/m^2) 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

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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 Çelebi University Atatürk 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 ≥ 3. Exclusion criteria were a history of trauma, malignancy, uncontrolled endocrine disorders, fibromyalgia syndrome, inflammatory rheumatic diseases, acquired or congenital malformations (spondylolisthesis, 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.

2. Evaluation of pain: Visual Analog Scale (VAS).

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.

Table 1: Sociodemographic characteristics of patients

		n (%)
Education	Illiterate/primary school	37 (52.9%)
	High school	20 (28.6%)
	University	13 (18.6%)
Martial status	Married	47 (67.1%)
	Single	17 (24.3%)
	Widow/widower	6 (8.6%)
Income rate	2000 ₺ or less	54 (77.1%)
	2000-4000 ₺	12 (17.1%)
	4000-8000 ₺	4 (5.7%)

₺: Turkish lira

Table 2: Descriptive statistics

	Number	Minimum	Maximum	Mean	SD
Age	70	20	65	43.6	13.28
BMI	70	15.94	43.7	28.23	6.14
Waist C.	70	72	127	95.76	12.71
VAS	70	4	10	6.41	1.91
ODI	70	2	27	14.43	5.84
Katz ADL	70	5	6	5.81	0.39
BFPS	70	13	56	36.21	10
LLA	70	12.0	62.3	35.8	10.34
SIA	70	27.5	62.3	44.23	8.18
K-L Grade	70	1	3	1.94	0.74

BMI: Body Mass Index, Waist C: Waist Circumference, VAS: Visual Analog Scale, ODI: Oswestry Disability Index, ADL: Activities of Daily Living, BPFS: Back Pain Functional Scale, LLA: Lumbar Lordosis Angle, SIA: Sacral Inclination Angle, K-L: Kellgren-Lawrence SD: Standard deviation

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).

Table 3: Comparison of VAS, ODI, Katz ADL scale, BPFS, LLA, SIA and K-L by gender

	Gender		
	Female (n = 47) mean(SD)	Male (n = 23) mean(SD)	*P*-value
VAS	6.45 (1.92)	6.35(1.95)	0.333*
ODI	15.09(5.37)	13.09(6.65)	0.181**
Katz ADL	5.72(0.452)	6.0(0.0)	0.006*
BPFS	34.38(9.88)	39.96(9.37)	0.027**
LLA	37.56(9.52)	32.23(11.23)	0.042**
SIA	45.12(7.38)	42.42(9.55)	0.198**
K-L	2.0(0.69)	1.83(0.83)	0.813*

VAS: Visual Analog Scale, ODI: Oswestry Disability Index, ADL: Activities of Daily Living, BPFS: Back Pain Functional Scale, LLA: Lumbar Lordosis Angle, SIA: Sacral Inclination Angle, K-L: Kellgren-Lawrence Classification, SD: standard deviation,*Mann Whitney U, **Student t- test

Table 4: Comparison of VAS, ODI, Katz ADL scale, BPFS, LLA, SIA and K-L by educational level

	Educational level			
	Illiterate/primary school (n= 37) mean(SD)	High school (n=20) mean(SD)	University (n= 13) mean(SD)	*P*-value
VAS	6.68(2.02)	6.55(1.96)	5.46(1.27)	0.550*
ODI	15.86(6.09)	12.50(6.07)	13.31(3.59)	0.085**
Katz ADL	5.76(0.44)	5.80(0.41)	6.00(0.0)	0.195*
BPFS	32.57(10.24)	40.55(8.90)	39.92(6.97)	0.004**
LLA	36.86(8.9)	33.27(10.7)	36.72(13.4)	0.436**
SIA	44.59(7.0)	42.67(9.42)	45.61(9.40)	0.562**
K-L	2.08(0.72)	1.80(0.834)	1.77(0.60)	0.256**

VAS: Visual Analog Scale, ADL: Activities of Daily Living, BPFS: Back Pain Functional Scale, LLA: Lumbar Lordosis Angle, SIA: Sacral Inclination Angle, SD: standard deviation, K-L: Kellgren-Lawrence Classification, ODI: Oswestry Disability Index,*Kruskal Wallis, **ANOVA

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 with functionality and radiographic measurements are shown in Table 6.

Table 5: Correlation of LLA, SIA and K-L with VAS, ODI, Katz ADL and BPFS

	LLA		SIA		K-L	
	r	*P*-value	r	*P*-value	r	*P*-value
VAS	-0.082	0.449*	-0.144	0.235*	0.120	0.324*
ODI	0.114	0.346**	-0.033	0.785**	0.183	0.130*
Katz ADL	-0.088	0.468*	-0.090	0.459*	-0.187	0.121*
BPFS	-0.188	0.118**	0.052	0.670**	-0.220	0.068*

VAS: Visual Analog Scale, ADL: Activities of Daily Living, BPFS: Back Pain Functional Scale, LLA: Lumbar Lordosis Angle, SIA: Sacral Inclination Angle, K-L: Kellgren-Lawrence Classification, ODI: Oswestry Disability Index, *Spearman correlation, **Pearson correlation

Table 6: Correlation of VAS, ODI, Katz ADL scale, BPFS, LLA, SIA and K-L with age, BMI and waist circumference

	Age		BMI		Waist circumference	
	r	*P*-value	r	*P*-value	r	*P*-value
VAS	0.009	0.942*	-0.140	0.248*	-0.226	0.60*
ODI	-0.022	0.854**	0.047	0.700*	0.009	0.941**
Katz ADL	-0.198	0.100*	-0.172	0.155*	-0.234	0.051*
BPFS	-0.081	0.503**	-0.120	0.322*	-0.043	0.726**
LLA	0.170	0.160**	-0.017	0.889*	-0.044	0.715**
SIA	0.262	0.028**	0.029	0.809*	0.025	0.835**
K-L	0.633	<0.001*	0.395	0.001*	0.442	<0.001*

BMI: Body Mass Index, VAS: Visual Analog Scale, ADL: Activities of Daily Living, BPFS: Back Pain Functional Scale, LLA: Lumbar Lordosis Angle, SIA: Sacral Inclination Angle, K-L: Kellgren-Lawrence Classification, ODI: Oswestry Disability Index,*Spearman correlation, **Pearson correlation

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.

Ayvat 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 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

1. Krismer M, van Tulder M, Low Back Pain Group of the Bone and Joint Health Strategies for Europe Project. Strategies for prevention and management of musculoskeletal conditions. Low back pain (non-specific). Best Pract Res Clin Rheumatol [Internet]. 2007 Feb;21(1):77–91. Available from: http://www.ncbi.nlm.nih.gov/pubmed/17350545
2. Sarıkaya S, Ozdolap S, Gumustas S, Koc U. Low back pain and lumbar angles in Turkish coal miners. Am J Ind Med 2007;50:92-6.
3. Nakipoğlu güldal funda, Karagöz A, Özgirgin N. the biomechanics of the lumbosacral region ın acute and chronic low back pain patients. painphysician. 2008;11(4):505–11.
4. Winnard A, Debuse D, Wilkinson M, Tahmosybayat R, Caplan N. The immediate effects of exercise using the Functional Re-adaptive Exercise Device on lumbopelvic kinematics in people with and without low back pain. Musculoskelet Sci Pract [Internet]. 2017 Jul;27 Suppl 1(7):S47–53. Available from: http://www.ncbi.nlm.nih.gov/pubmed/28173931
5. Choi S-A, Cynn H-S, Yi C-H, Kwon O-Y, Yoon T-L, Choi W-J, et al. Isometric hip abduction using a Thera-Band alters gluteus maximus muscle activity and the anterior pelvic tilt angle during bridging exercise. J Electromyogr Kinesiol [Internet]. 2015 Apr;25(2):310–5. Available from: http://www.ncbi.nlm.nih.gov/pubmed/25262160
6. Amonoo-Kuofi HS. Changes in the lumbosacral angle, sacral inclination and the curvature of the lumbar spine during aging. Acta Anat 1992;145:373-7.
7. Yakut E, Duger T, Oksuz C, Yorukan S, Ureten K, Turan D et al.Validation of the Turkish version of the Oswestry Disability Index for patients with low back pain. Spine 2004;29(5):581-5.
8. Koç M, Bayar K. Turkish version of the Back Pain Functional Scale: validity and reliability study. J Exerc Ther Rehabil. 4(2):82-9.
9. Pehlivanoğlu Özkan EF, Özkan MU, Balcıoğlu H, Bilge U, Ünlüoğlu İ. Adjustment and Reliability of Katz Daily Life Activity Measures for Elderly in Turkish. Ankara Med J. 2018;(2):219-23. doi: 1017098/amj.435264.
10. Onyemaechi NO, Anyanwu GE, Obikili EN, Onwuasoigwe O, Nwankwo OE. Impact of overweight and obesity on the musculoskeletal system using lumbosacral angles. Patient Prefer Adherence [Internet]. 2016;10:291–6. Available from: http://www.ncbi.nlm.nih.gov/pubmed/27022251
11. Ashraf A, Farahangiz S, Pakniat Jahromi B, Setayeshpour N, Naseri M. Correlation between Degree of Radiologic Signs of Osteoarthritis and Functional Status in Patients with Chronic Mechanical Low Back Pain. Malays J Med Sci [Internet]. 2014 Mar;21(2):28–33. Available from: http://www.ncbi.nlm.nih.gov/pubmed/24876804
12. Hinkle DE, Wiersma W, Jurs SG. Applied Statistics for the Behavioral Sciences. 5th ed. Boston: Houghton Mifflin; 2003.
13. Unde Ayvat P, Aydın ON, Oğurlu M. [Risk factors associated with lower back pain in the Polyclinic of Algology]. Agri [Internet]. 2012;24(4):165–70. Available from: http://www.ncbi.nlm.nih.gov/pubmed/23364779
14. Turkish Endocrinology and Metabolism Association, Obesity Diagnosis and Treatment Guideline 2019, [Online]. Available: https://temd.org.tr/admin/uploads/tbl_kilavuz/20190506163904-2019tbl_kilavuz5ccdcb9e5d.pdf
15. Ibrahimi-Kaçuri D, Murtezani A, Rrecaj S, Martinaj M, Haxhiu B. Low back pain and obesity. Med Arch (Sarajevo, Bosnia Herzegovina) [Internet]. 2015 Apr;69(2):114–6. Available from: http://www.ncbi.nlm.nih.gov/pubmed/26005262
16. Chowdhury D, Sarkar S, Rashid MH, Rahaman A, Sarkar SK, Roy R. Influence of body mass index on low back pain. Mymensingh Med J [Internet]. 2014 Jan;23(1):125–9. Available from: http://www.ncbi.nlm.nih.gov/pubmed/24584385
17. Murray KJ, Le Grande MR, Ortega de Mues A, Azari MF. Characterisation of the correlation between standing lordosis and degenerative joint disease in the lower lumbar spine in women and men: a radiographic study. BMC Musculoskelet Disord [Internet]. 2017 Aug 1;18(1):330. Available from: http://www.ncbi.nlm.nih.gov/pubmed/28764702.

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