

Correlation between Degree of Radiologic Signs of Osteoarthritis and Functional Status in Patients with Chronic Mechanical Low Back Pain

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Abstract

Background: Osteoarthritis is the most intervening factors in producing mechanical low back pain (LBP). We aimed to evaluate the correlation between radiologic signs of osteoarthritis and functional status in patients with chronic mechanical LBP.

Methods: Severity of osteoarthritis and disability were evaluated with Kellgren and Lawrence Grading Scale (K&L) by simple lumbar X-ray and Oswestry Disability Questionnaire (ODQ) respectively.

Results: Although there was no significant correlation between ODQ and K&L score in general, the correlation was seen in female group ($P = 0.024$, $r = 0.207$).

Conclusions: Mechanical LBP provides more disability in females suffering from more advanced osteoarthritis.

Keywords: disability, low back pain, osteoarthritis, radiography, spondylosis

Introduction

One of the most common complaints of patients referring to rehabilitation clinics is low back pain (LBP). It is reported in different studies that the prevalence is approximately 84% or more during a person's lifetime (1).

Osteoarthritis is one of the most intervening factors in producing mechanical LBP, and it usually presents with the degeneration in the weight bearing joints like the knee, femur, cervical, and lumbosacral spines (2,3). These degenerative changes characterised radiologically by the presence of disc space narrowing, osteophytes formation, sclerotic changes in bone which leads to the deformity of the spine (2,3).

Although osteoarthritis is shown to have a broad spectrum role in developing LBP in previous studies, a different degree of osteoarthritis is seen

in normal people without LBP (1,4,5). Also, it has been seen that radiologic signs of osteoarthritis of the spine is more prominent with advanced age and has no specific relation with patients' symptoms (1-3). Maus 2010 (6), concluded that imaging findings of the structural changes of osteoarthritis do not correlate with pain production. In a survey by Muraki et al. (7) LBP was not significantly associated with incident radiographic lumbar spondylosis, while a more severe Kellgren and Lawrence Grading Scale (K&L) grade at baseline was associated with incident LBP. Even if the patient has no complaints about pain, these degenerative changes are important in restriction of spinal movements, especially in bending forward and backwards (8). The correlation between degenerative changes of the spine and spinal pain has been the main focus of research to a study by Marchiori and Henderson (9),

showed an association between higher disability ratings and increased levels of degeneration in the cervical spine in women. A cross-sectional study by Peterson et al. (10) with the purpose of determining whether similar disability correlations to spinal degeneration are observed in the lumbar spine was performed on a sample of patients suffering from LBP either due to traumatic or non-traumatic causes and obtained findings markedly different from those in the cervical spine research. There was a weak correlation between LBP severity and radiographically detected lumbar spine degeneration. Also, no association was found between the number of levels of degeneration and disability scores. Later, Arana et al. (11) in 2006 investigated the relationship between LBP, disability and magnetic resonance imaging findings (MR) in patients undergoing surgery for degenerative lumbar spinal stenosis and reported that imaging scores only correlated with pain interference with normal work, but not with other disability questions.

Some other studies which tried to report the association of degenerative changes of the spine with LBP concluded that disc space narrowing specially in multiple lumbar levels has more association with LBP (1,5,12). Muraki and colleagues (13) found that K&L ≥ 3 spondylosis was related to the pain only in women. So, disc space narrowing with or without osteophytosis in women may be a risk factor for LBP. Also, recent studies showed that females with osteoarthritis become more functionally disable than males (14).

Bearing these insufficient and equivocal evidences in mind, performing well-designed studies with main focus on the subject of correlation between radiologic signs of osteoarthritis of the spine and functional status in patients with mechanical LBP seems to be necessary. To the best of our knowledge, this is the first study aimed to find a possible correlation between osteoarthritis severity involving lumbar spine and level of disability in a group of patients suffering from chronic mechanical LBP no other types of LBP with different causes such as spinal stenosis or trauma.

Materials and Methods

In this cross-sectional study, 150 Iranian patients with an age range of 19 to 85 years old suffering from clinical signs and symptoms of mechanical LBP for at least three months who referred to physical medicine and rehabilitation clinics affiliated to Shiraz University of Medical

Sciences from January 2011 to June 2012 were included. All participants were patients referred by their family physicians because of not responding to routine medical therapy. Mechanical LBP was defined as a multifactorial axial LBP generated by deconditioning; poor muscle recruitment; emotional stress, and changing associated with aging such as disk degeneration and ligamentous hypertrophy not the result of systemic disease (1,15). Final diagnosis of mechanical LBP was made by an expert physiatrist and subjects with secondary causes of LBP (trauma, congenital anomaly, spinal infection, rheumatologic problems), patients with a history of radicular LBP (leg pain greater than back pain) and those with a previous history of spinal surgery were excluded. Each individual gave their informed consent before study. The study protocol was in agreement with the Declaration of Helsinki (October 2008 revision) and approved by Shiraz University of Medical Sciences ethic committee.

Lumbar lateral radiographs were used for detection of severity of osteoarthritis and scored by the K&L grading scale by an expert radiologist (16). In this Scale:

1. Grade 0: None,
2. Grade 1: doubtful narrowing of joint space and possible osteophytic lipping,
3. Grade 2: definite osteophytes, definite narrowing of joint space,
4. Grade 3: moderate multiple osteophytes, definite narrowing of joint space, some sclerosis and possible deformity of bone contour,
5. Grade 4: large osteophytes, marked narrowing of joint space, severe sclerosis and definite deformity of bone contour

Functional disability of patients was measured by the Persian version of Oswestry Disability Questionnaire (ODQ) which has already been validated. This simple and fast scale is a reliable and valid instrument to measure functional status in Persian-speaking patients with LBP and its use in clinical settings and outcome studies in Iran is recommended by a pioneer study (17,18). It has 10 parts made up of ordinary daily activity like sitting, standing, sleeping, weight lifting, walking, social activity, travelling, sexual activity, self-care, and severity of back pain. Each part scored from 0 to 5 and the final score was announced by the percentage as:

0 to 20: Minimal disability, 21 to 40: Moderate Disability, 41 to 60: Severe Disability, 60 to 80: Crippled, 81 to 100: Bed Ridden

The questionnaires were filled by a physical medicine resident via interviews with the patients. All analyses were done by SPSS 16 and statistical methods which were used in this study were included independent samples t test, Kruskal-Wallis test, Mann-Whitney test, and Spearman's correlation coefficient. In all statistical analysis $P < 0.05$ was considered significant. We used non-parametric tests (Kruskal-Wallis test and Mann-Whitney test) for ordinal data and in situations which unequal sample sizes should be compared.

Results

One hundred and fifty patients (119 females, 31 males), with chronic mechanical LBP with an age range of 19 to 85 years old (mean age of 42.14 and standard deviation (SD) of 11.01 years) were studied. Regarding age distribution of LBP, patients were divided into six groups and each parameter was measured separately.

Regarding ODQ, patients' disability had the minimum of 7% and the maximum of 78% with the mean of 30.52 and SD of 13.76%. The majority of females (52.1%) and the majority of males (67.7%) had moderate functional disability (21 to 40%). In statistical analysis with independent samples t test, there was a significant association between gender and the percentage of disability as females were more disable than males ($P = 0.017$). Statistical analysis with Kruskal-Wallis test showed significant relationship between age group and ODQ score and suggested that the ODQ score increased with ageing ($P = 0.009$) (Figure 1).

The majority of patients in either male or female group had osteoarthritis grade one. With respect to Mann-Whitney test there was no significant association between gender and severity of osteoarthritis ($P = 0.148$) (Table 1). According to Kruskal-Wallis test there was significant relationship between age group and severity of osteoarthritis ($P = 0.003$). The most noticeable effect was seen in the group of patients over 60 years old (Table 2, Figure 2).

On the other hand, with dividing patients into two categories of lesser than 50 and more than 50 years old, we found different results. There was a significant increase in K&L grade scale in females over 50 years (Kruskal-Wallis test, $P = 0.001$), but no difference was seen in males in

these two groups ($P = 0.938$). Also, there was significant increase in K&L scale in men less than 50 years old in comparison with women in this age group (Kruskal-Wallis test, $P = 0.021$).

Although there was no significant correlation between ODQ and severity of osteoarthritis in general ($P = 0.169$), this correlation was seen in female group (Spearman's correlation test, $P = 0.024$, $r = 0.207$) (Figure 3). With reference to Spearman's test there was no significant correlation between the score of ODQ and severity of osteoarthritis in different age groups.

Discussion

As mentioned previously, osteoarthritis is one of the most common factors affecting joints and its prevalence has increased with aging, particularly in people over 60, which has been also proven by previous studies (1,2)

Our study showed that there is no significant correlation between severity of osteoarthritis and gender. When we divided the population into two categories of ages (more and less than 50), interestingly such correlation was observed with

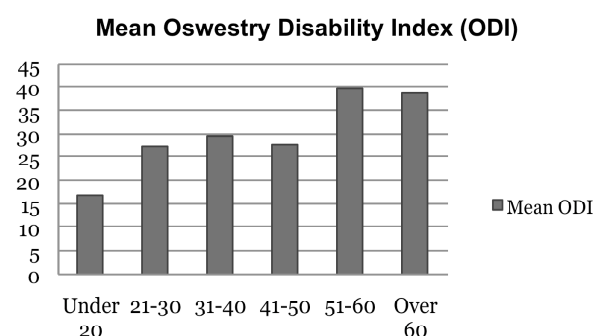


Figure 1: Mean ODI in different age groups (ODI: Oswestry Disability Index).

Table 1: The distribution of patients with different grade of osteoarthritis in total and gender

K&L ^a Grade	Female	Male	Total
	No (%)		
0	0	1 (3.2%)	1 (0.7%)
1	92 (77.3%)	19 (61.3%)	111 (74.0%)
2	20 (16.8%)	5 (16.1%)	25 (16.7%)
3	7 (5.9%)	4 (12.9%)	11 (7.3%)
4	0	2 (6.5%)	2 (1.3%)

^aKellgren and Lawrence Grading Scale.

a significant higher K&L grade in men under 50 years in comparison with women in this age group. In a population-based cohort in 2009, gender was reported to be distinctly associated with K&L >

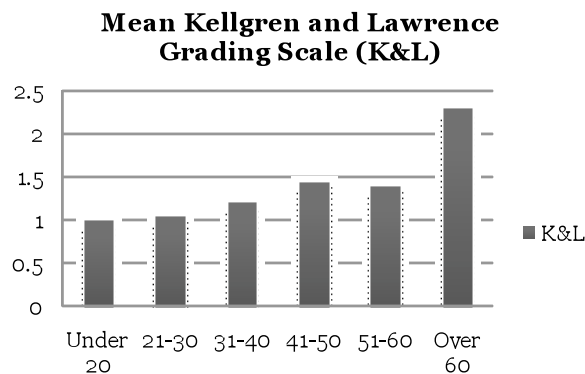


Figure 2: Severity of osteoarthritis in different age groups according to the mean K&L (K&L: Kellgren and Lawrence Grading Scale).

Table 2: Severity of osteoarthritis in different age groups

Age group (year)	Number of Persons	K&L grade ^a
Under 20	2	1 (0)
21–30	19	1 (0)
31–40	46	1 (0)
41–50	51	1 (1)
51–60	25	1 (1)
Over 60	7	3 (2)

^aKellgren and Lawrence Grading Scale, Median (Interquartile Range).

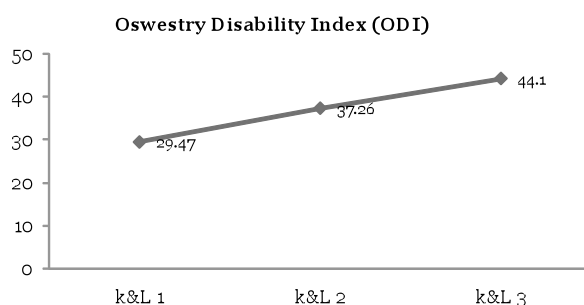


Figure 3: Mean ODI in females with different grades of osteoarthritis (K&L: Kellgren and Lawrence Grading Scale, ODI: Oswestry Disability Index).

or = 2 and K&L > or = 3 lumbar spondylosis as K&L > or = 2 spondylosis was more prevalent in men and K&L > or = 3 was more prevalent in women (13). In contrast, our findings showed that both K&L > or = 2 and K&L > or = 3 were more prevalent in male group (Table 1). Also, a study by Felseon et al. (8) suggested that osteoarthritis in most of the joints is more prevalent in males before 50 years than in females. This relation could not be proved in ages over 50; this may be influenced by the lesser number of people in this age group.

We found that there was no significant correlation between ODQ and severity of osteoarthritis. This is somewhat concordant with a pioneering study done in 1966 by Lawrence et al. (19) which showed a significant correlation between the frequency of symptoms with radiologic findings of osteoarthritis in all joints except those of the lumbar spine. This study was not performed in a specific sample with LBP and authors didn't use ODQ as a valid instrument for measuring disability. Also, Kalichman & Colleagues (5) in 2008 evaluated facet joint osteoarthritis in patients with LBP and provided similar reports regarding the association between symptoms and radiologic findings. So, we can conclude that the changes of lumbar spine due to osteoarthritis is the natural part of aging process and may not necessarily come with pain and disability (12).

On the other hand, although there was no significant correlation between ODQ and severity of osteoarthritis in general, it seems evident in females, thus females may be more disable due to osteoarthritis than males which also has been mentioned in Bulletin of the World Health Organization 2003 (14). The prevalence of disability and burden of musculoskeletal conditions such as osteoarthritis, rheumatoid arthritis, osteoporosis, and low back pain is higher among females than males (14). These results are in conflict with Peterson and colleagues (10) reports who found no difference between men and women in any of self-reported scores regarding the pain and disability.

Despite above findings, there is a similar study done by Horváth et al. (20) published in 2009 on Hungarian population in which Oswestry Disability Index (ODI) showed significant higher scores in a group of LBP patients with signs of lumbar spine radiographic degeneration changes in comparison to the radiological negative group of patients with LBP. This discrepancy between this finding and our study results might be due to differences in demographic data and

methodology. Horváth et al. included all patients reported a history of LBP not just patients with mechanical LBP. Also, they did not categorised spinal degenerative changes severity according to K&L in order to be able to analyse the correlation between osteoarthritis severity and level of disability.

To the best of our knowledge, the survey by Peterson et al. (10) is the only study investigated the correlation between the level of disability, according to ODI and severity of spinal degeneration in LBP patients. They found a weak correlation between the severity of disc and facet degeneration and self-reported ability to stand without increasing the pain. Asking about interference with the ability to stand is one of 10 sections consisting OQD. Patients with more severe degenerative changes tend to have more pain while standing. Because we did not perform such subscale analysis, we cannot make precise comparison. In the Peterson et al. study both groups of patients with and without history of trauma were included and they didn't focus on patients with chronic mechanical LBP. Therefore, subjects recruited in the study were different from our sample. The way that this study classified degenerative spinal changes radiographically is completely different too. They didn't use K&L as a measure for assessing osteoarthritis severity. We should note that we faced some limitations during this study, like the absence of control group, lack of equal number of females and males, lack of enough people in each age group, and different scaling systems for estimating severity of osteoarthritis. Against 119 females, there were only 31 men and this limited number of men not only can compromise men group analyses but also makes comparisons between male and female groups difficult. Half of the subjects were less than 40 years old and most of them had osteoarthritis (OA) of grade one. This may be one of the reasons that we didn't find any correlation between OA and functional status. We should've also investigated the effect of obesity on complaints and radiologic status of individuals. Categorising patients according to the different causes of mechanical LBP might help us provide more fuseful analyses. We hope that with eradicating these effects we could obtain more conclusive results in future studies.

Conclusion

In conclusion, our study confirmed this hypothesis that there is a significant enhancement in patient disability with increasing the severity

of osteoarthritis only in female group. It is also supported by previous studies that have been shown females with osteoarthritis get more disabled than males.

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Conflict of Interest

None.

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Authors' Contributions

Conception and design: AA, SF
Analysis and interpretation of the data, drafting of the article: BPJ, NS, MN
Critical revision of the article for the important intellectual content and final approval of the article: AA, SF, BPJ, NS, MN
Provision of study materials or patient: AA
Collection and assembly of data: AA, BPJ, NS

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