

Facet Joint Changes In The Lumbar Spine Of Adults Presenting With Chronic Low Back Pain At Kakamega County General And Referral Hospital.

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Abstract

Background: Chronic low back pain is referred to as pain and discomfort around the lumbar region lasting > twelve weeks. Lumbar spinal anatomical changes can predispose a patient to chronic low back pain and the commonest reason for the outpatient musculoskeletal visits. The effect has resulted into social, psychological and economic problems. Proper diagnosis and management can drastically improve patients' quality of life, families and society.

Aims and objectives: The aim of study was to evaluate facet joint changes in the lumbar spine of adult patients presenting with chronic low back pain at Kakamega County General and referral hospital.

Study design: This was a cross-sectional quantitative descriptive study where patients' data was collected during patients' presentation at orthopedic outpatient clinic and MRI department.

Methodology: Purposive sampling of lumbar spine Magnetic resonance imaging scans was used to obtain data. A total of 144 patients were selected using Yamane Taro formula. Facet joint changes were assessed from selected MRIs to evaluate structural changes of lumbar spine predisposing patients to chronic low back pain. Descriptive statistics was used to evaluate data while chi square test analyzed the level of significance with sociodemographic characteristics of study participants.

Results: Out of the total 144 study participants, the abnormal facet joint changes were observed in 29.2% (n=42) and bilateral facet joint effusion was the most common abnormality present in 18.8% (n=27) of the study participants

Conclusion: Bilateral facet joint erosion may predispose one to chronic low back pain. Therefore, this study recommends weight reduction, early screening and treatment to avert pain.

Keyword: Chronic low back pain, lumbar spine, facet joint

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I. Introduction

Lower back also referred to as the lumbar region or spine is the area of spine located inferior to the twelfth thoracic vertebrae (T12) ending at the superior part of the first sacral vertebrae (S1) (Munsif, 2016). Several structures make up the lumbar spine namely soft tissue, five movable vertebrae (L1- L5), intervertebral discs, zygapophyseal joint and neurovascular structures (Gray, 2000). The lumbar vertebrae (L1 – L5) are usually heaped jointly to form part of the spinal canal. The spinal canal acts as a tunnel housing the spinal cord and its respective nerves therefore preventing it from injury. The lumbar vertebra provides strong structural support to the upper part of the spine and is also connected to the pelvis (Netter, 2018). It bears most of the body's weight, stresses of lifting and carrying items.

Chronic low back pain (CLBP) is one of the common musculoskeletal symptoms that affects lower part of the spine (El-Tallawy et al., 2021). It is described as pain and discomfort around the lumbar region lasting for more than twelve weeks (Traeger et al., 2019). Generally pain in the lower back can be associated with skin covering the lower back, muscles, lumbar vertebrae, intervertebral discs, spinal cord, neurovascular structures as well as internal organs of the pelvis and abdomen (Nelson et al., 2014).

The symptoms of chronic low back pain might range from dull ache to a stabbing or shooting sensation. This nature of pain may be localized around the axial region or radiate to the lower limbs affecting the patients' daily activities (Seminowicz et al., 2011). The severity of pain is dependent on the anatomical structure of the low back affected or injured (Cedraschi et al., 2016).

Chronic low back pain is the most common reason for outpatient musculoskeletal visits (Wu et al., 2020). The point prevalence rate of CLBP by the International Association for the study of pain (IASP) in 2017 was estimated to be about 7.5 % of the global population. In Africa, the mean prevalence rate of CLBP was

approximated to be 33% in adolescents and 50% in adults (Mwangi et al., 2019). However, in Kenya there is sparse information regarding common spinal anatomical changes implicated in chronic low back pain. The effect may result into social, psychological and economic problems (Maher & Ferreira, 2022). Proper diagnosis and management can drastically improve patients quality of life, families and society (Gilligan et al., 2021). This study, therefore, sought to examine facet joints anatomical changes associated with CLBP. This knowledge from the study shall be disseminated to the medical training institutions and all health care providers.

II. Materials And Methods

This was a cross sectional quantitative descriptive study where 144 study participants were purposively selected during their visit at orthopedic outpatient clinic and MRI department at Kakamega County Teaching and Referral Hospital, Western Kenya. The study included 99 female and 45 male patients who presented with history of chronic low back pain for more than 12 weeks, had consented to the study and were referred for lumbar spine MRI scans. Autonomy and confidentiality of study participants was ensured. Sociodemographic characteristics of study participants was recorded in data collecting tool thereafter, lumbar spine MRI was done using Magsense 360, Mindray brand with 0.5 Tesla strength as per hospital's SOP. Axial, sagittal T1, T2 and T2 STIR weighted MRI scans of the lumbar spine were reviewed by the principal investigator to identify and document changes within the facet joints. The findings were corroborated by two board certified consultant radiologist. An observational descriptive statistic was used to evaluate facet joint changes associated with CLBP while a chi square test was used to find out the relationship between anatomical facet joint changes with CLBP. Research license was obtained from National Commission for Science, Technology & Innovation (NACOSTI) license No: NACOSTI/P/23/2. Authorization to collect data was granted by Kakamega county General Hospital Ethics Review committee under license No. ERC/196-04/2023.

III. Results

Lumbar spine anatomical structures associated with chronic low back pain

The abnormal facet joint changes were observed in 29.2 % (n= 42) of the total 144 patients. Bilateral facet joint effusion was the most common abnormality present in 18.8% (n=27) of the study participants (Table 1).

Table 1: Facet joint effusion of patients with CLBP

Lumbar spine anatomical structures		frequency	Percentage
Facet joints	Right facet joint effusion.	15	10.4%
	Left facet joint effusion.	0	0.0%
	Bilateral erosion	27	18.8%
	Normal	102	70.8%

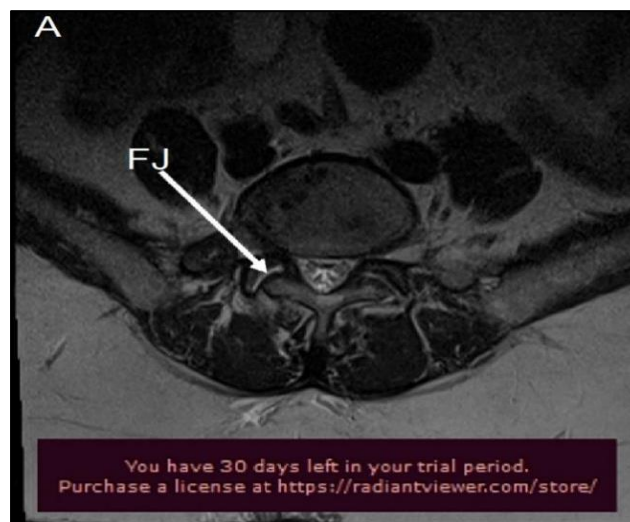


Figure 1: MRI axial view of the lumbar spine showing facet joint erosion
KEY: FJ- Facet joint erosion and MRI - Magnetic resonance imaging

Effusion of the articular surfaces may predispose one to chronic low back pain. Articular surfaces of the joints contain hyaline cartilage which can easily be compressed due to its elasticity, therefore accommodating enormous compressional and shear forces during weight bearing. Accumulation of fluid within this articular surfaces is referred to as facet joint effusion (Figure1). This is caused by inflammation and break

down of the cartilage triggering pain sensations within spinal nerve endings therefore leading to chronic low back pain.

Association between sociodemographics and severity of chronic low back pain

This analysis was conducted using the Chi-square test, and results were interpreted based on the p-value, with a level of significance set at $p < 0.05$. In terms of facet joint changes, Right facet joint effusion was more prevalent in females (8.3%, $n=12$) than males (2.1%, $n=3$), while bilateral effusion was almost equally distributed between females (10.4%, $n=15$) and males (8.3%, $n=12$). More females presented with this morphological change than males at 14.6% ($n=21$) and 4.2% ($n=6$) respectively. Therefore, this observation indicates that there is a higher susceptibility to facet joint erosion among female participants in this study (Table 2)

Table 2. Association between lumbar spine anatomical changes causing chronic low back pain with gender

Lumbar spine anatomical structures		Gender				Chi-square & p value
		Female		Male		
		n	%	n	%	
Facet joints	Right facet joint effusion	12	8.3	3	2.1	Chi =2.744 df=2 P= .254
	Left facet joint effusion.	0	0.0	0	0.0	
	Bilateral erosion	15	10.4	12	8.3	
	Normal	69	47.9	33	22.9	

Table 3 below presents the association between lumbar spine anatomical changes causing chronic low back pain with different age groups. Facet joint changes exhibited a significant association with age (Chi-square=20.374, $p=0.009$).

Table 3. Association between lumbar spine anatomical changes causing chronic low back pain with age group.

Lumbar spine anatomical structures		Age group						Chi-square & p value
		34-44	45-54	55-64	65-74	75-84	85>	
		%	%	%	%	%	%	
Facet joints	Right facet joint erosion/effusion,	4.2	4.2	2.1	0.0	0.0	0.0	Chi = 20.374 Df=8 p=0.009*
	Left facet joint erosion/effusion.	0.0	0.0	0.0	0.0	0.0	0.0	
	Bilateral erosion	4.2	4.2	4.2	2.1	4.2	0.0	
	Normal	8.3	22.9	25.0	10.4	4.2	0.0	

Table 4 provides an overview of the association between lumbar spine anatomical causing chronic low back pain and weight categories. Facet joint changes demonstrated a significant association with weight (Chi-square=17.831, $p=0.023$). Right facet joint effusion was only observed in higher weight category of 79-88 at (6.3%).

Table 4. Association between lumbar spine anatomical changes causing chronic low back pain with weight categories

Lumbar spine anatomical structures		Weight categories					Chi square
		48-58	59-68	69-78	79-88	88>	
		%	%	%	%	%	
Facet joints	Right facet joint erosion/effusion,	0.0	0.0	0.0	6.3	4.2	Chi= 17.831 Df=8 p=0.023*
	Left facet joint erosion/effusion.	0.0	0.0	0.0	0.0	0.0	
	Bilateral erosion	2.1	2.1	6.3	4.2	4.2	
	Normal	8.3	10.4	12.5	16.7	22.9	

IV. Discussion

Facet joint changes of the lumbar spine associated with chronic low back pain

Anatomical structural facet joint changes can predispose one to CLBP. A facet joint is formed by the articulation of two consecutive lumbar vertebrae. This articulations form three joints namely, one joint formed between two vertebral bodies and the intervertebral disc while the other two joints are formed by the articulation of the superior articular process of one vertebrae and the inferior articular processes of the vertebrae just above it. The primary function of the facet joint in the normal vertebral column is to protect the motion segment from excessive rotation, anterior shear forces, and flexion (Buchowski & Kelly, 2018). The Articular surfaces of these facet joints contain a connective tissue referred to as hyaline cartilage. The hyaline cartilage can easily be compressed due to its elasticity, therefore accommodating enormous compressional and shear

forces during weight bearing. Excess compressional and shear forces may cause injury leading to inflammation resulting to accumulation of fluid within these articular surfaces. This is commonly referred to as facet joint effusion (Figure1). Fluid accumulation within articular surfaces triggers pain sensations within spinal nerve endings that results into chronic low back pain (Geurts *et al.*, 2018). Facet joint erosion occurs as a result of chondral loss in a joint. Facet joint changes are known to cause joint osteoarthritis and low back pain. In this study, a total of 29.2% of patients had abnormal facet changes, 18.8% had bilateral facet joint effusion (Table1). These findings are similar to (Chaoyuan Li, *et al.*, 2022) who noted that most patients who suffered from CLBP bilateral facet joint effusion that might cause lumbar instability hence causing CLBP. At advanced stages, worse end facet changes can cause joint erosion thus predisposing one to CLBP.

Association between sociodemographic and severity of chronic low back pain

It was observed that more females presented with this morphological change than males at 14.6 % (n=21) and 4.2 % (n=6) respectively. Therefore, this observation indicates that there is a higher susceptibility to facet joint erosion among female participants. These findings are in contrast to a study (Kazunori *Shinto et al* ,2019) in japan on prevalence of facet joint erosion and its relationship with lumbar spondylolithesis and low back pain where the results did not differ significantly with gender and did not tend to increase with age. Facet joint changes exhibited a significant association with age (Chi-square=20.374, p=0.009). Bilateral facet joint erosion was common in almost all age groups. This findings are in contrast with a study (Caterini, R., Mancini, F., Bisicchia, S. *et al*) that found these changes common among the elderly patients with chronic low back pain.

The present study noted significant association between facet joint changes with weight (Chi-square=17.831, p=0.023).. This findings are similar to (Wolfe *et al.*, 2002) in which patients with weight above 74kg had facet joint changes as examined on MRI. The study also postulates that patients weighing more than 75 kg experience more compressional and shear forces on the articular surfaces therefore predisposing them to effusion or chondral loss of the joint.. This may trigger pain sensation causing chronic low back Pain

V. Conclusion.

In this study, bilateral facet joint effusion was the major that may predispose one to chronic low back pain. Respondents weighing more than 70kg were also predisposed to structural lumbar spine anatomical change of the facet joints.