THE INCIDENCE AND CLINICO-RADIOLOGICAL FINDINGS IN SYMPTOMATIC ADULT PATIENTS WITH LUMBAR DEGENERATIVE DISC DISEASES IN A TERTIARY ORTHOPAEDIC HOSPITAL, SOUTH-WEST, NIGERIA

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ABSTRACT

Background: Lumbar Degenerative Disc Disease (LDDD) is a common pathology in adults all over the world. The incidence, knowledge and correlation of clinico-radiological features would be helpful to a physician treating degenerative lumbar spine disease to achieve a better outcome.
Objective: To determine the one year incidence of LDDD in National Orthopaedic Hospital Igbobi, (NOHI) Lagos common clinical (symptoms and signs) and radiological findings in adult symptomatic patients with LDDD and to also study the frequency and relationships of clinical features with imaging findings in them.
Methods: A cross sectional analytical study of 160 adult symptomatic patients aged 31-60 years with diagnosis of lumbar degenerative disc disease who were recruited consecutively in a spine unit between May, 2016 and April, 2017. The incidence, clinical symptoms, signs and imaging findings were studied and analysed using SPSS version 24.
Results: One hundred and sixty adult patients were studied with male to female ratio of 1:1.5, period incidence of 11.5% and mean age of 45.50(±14.50). The most involved lumbar disc in LDDD was L4/L5 (59.6%) while 55.6% of the patients had spondylolisthesis mostly at L4/L5. Almost all the patients (99.4%) had altered sensation symptoms with bilateral radiculopathy in 86.9% of them. Half (50%) of the participants had grade III Kellgren-Lawrence Classification of LDDD. There was a significant statistical relationship between altered sensation, radiculopathy and Modic grade 3 (p values< 0.05).
Conclusion: The annual incidence of LDDD was 11.5% in our study. Most patients presenting to hospital with LDDD in our settings are likely to present late with altered sensation, radicular symptoms and are likely to be of Modic grade 3. We therefore recommend that adult patients presenting with low back pain secondary to lumbar degenerative disc disease should be thoroughly investigated and adequately managed since they are likely to present late.

Key words: Lumbar Degenerative Disc Disease, Adult patients, Clinical and radiological findings

INTRODUCTION

Lumbar DDD is a general term used in literature to describe degenerative (anatomical) changes of the lumbar Inter-Vertebral Discs (IVDs) which eventually involves vertebral bodies, and/or associated joints of axial spine (facet joints) with consequential pathologies or clinical syndromes of discogenic back pain, lumbar radiculopathy, facet joint osteoarthritis, and segmental instability (1). It is used synonymously with lumbar degenerative spine disease, lumbar spondylosis, degenerative spondylosis, arthrosis of lumbar spine, disc degeneration or hypertrophic arthritis of lumbar spine (1-4). LDDD is an age-related degenerative disc disease of the lumbar spine which could be preceded by known disco-vertebral lesions such as trauma, "wear and tear", chemical changes or other spine insults resulting to degenerative changes (5-6). This group of disorders also may result into spinal foraminae or canal stenosis, degenerative spondylolisthesis, lumbar spinal instability, and degenerative scoliosis or kyphosis (5-7).

The prevailing symptoms of LDDD are low back pain, low back stiffness, lower limb radiculopathy, neurogenic claudication, numbness, muscle pulls or spasms. The degree of symptoms severity may not be directly related to the degree of pathological changes on spine imagings (5). Despite the high prevalence of LDDD in the population, the diagnostic approach, clinical and radiological features are diverse and often inconsistent (1).

Diagnosis may be challenging due to the complex anatomical structures that can produce similar symptoms from both lumbar spine (nerves, nerve plexus, muscles, ligaments and bones) and extra-spinal structures.

Lumbar Degenerative Disc Disease (LDDD) is the most common cause of acute and chronic Low Back Pain (LBP) globally and a leading cause of disability, morbidity and high socioeconomic burden (8-10). These constitute major health concerns for health care providers, patients, patients' relations and public health. The prevalence of LDDD varies with age, gender, heredity, geographical locations and races. The lifetime incidence of LBP is reported to be 60-90% with an annual incidence of 5%, and yearly, 14.3% of new patients consults primary care physicians for LBP, with close to 13 million physician consultations related to complaints of chronic LBP (11,12). However in Africa, Louw *et al* (13) reported a mean prevalence of LBP in adolescents and adults to be 12% and 32% respectively while the average lifetime prevalence in adolescents is 36% and among adults is 62%. Birabi *et al* (14) reported an incidence of LBP of up to 73.2% in a community based cross-sectional study in a rural peasant farmers in South-South Nigeria. The incidence of LDDD in Nigeria and/or West African is scarce in literature.

The purpose of this study was to determine the one year incidence of LDDD in National Orthopaedic Hospital Igbobi, (NOHI) Lagos common clinical (symptoms and signs) and radiological findings in adult symptomatic patients with LDDD and to also study the frequency and relationships of clinical features with imaging findings in them.

MATERIALS AND METHODS

This study was conducted in the Spine Unit, National NOHI, Lagos, Nigeria among 160 adult patients aged 31 to 60 years who presented with complaints of Low Back Pain (LBP) at outpatient clinic or emergency room between May 2016 and April 2017. The diagnosis of LDDD was made and the patients who met the inclusion criteria (adults aged 31 to 60 years with clinical features of LDDD, with or without its complication(s) presenting at spine and who did not have prior back surgery or pathology) and gave consent were included consecutively by balloting (for 'yes' from 'yes or no' ballot paper) till the sample size was completed. The sample size was based on the pilot study (average) of all patients who presented with LBP secondary LDDD in 2014, 2015 and 2016 at Health record department, NOHI.

At presentation, informed consent to participate in the study was taken. LDDD was diagnosed by tripods of detailed history taking, physical examinations, and lumbosacral imagings. Other investigations were appropriately done to rule out differential pathologies. Only imaging done within six weeks of presentation were used to increase the accuracy of the diagnosis and its extent while older lumbar imaging were repeated. Patient's demographic information, symptoms, findings on clinical examination as well as imaging findings were obtained by using the pretested questionnaires. The radiological findings such as end-plate sclerosis, reduced IVD, osteophytes, features of facet joints OA, spondylolisthesis, spinal canal stenosis, kyphosis, exaggerated lordosis and vertebral collapse were recorded. Radiological Kellgren-Lawrence spondylosis classification was documented. The MRI findings of spinal canal and foraminae stenosis as well as Modic changes were also assessed.

The data generated was analyzed using Statistical Package for Social Science (SPSS) version 24. The results obtained were presented and analysed by descriptive statistics numerical variables while the categorical variables such as gender and tribe were expressed in frequency and percentages. A confidence interval of 95% and a statistical significance of p value less than 0.05 was used in this study. Approval to conduct the study was obtained from the Ethical Committee of NOHI.

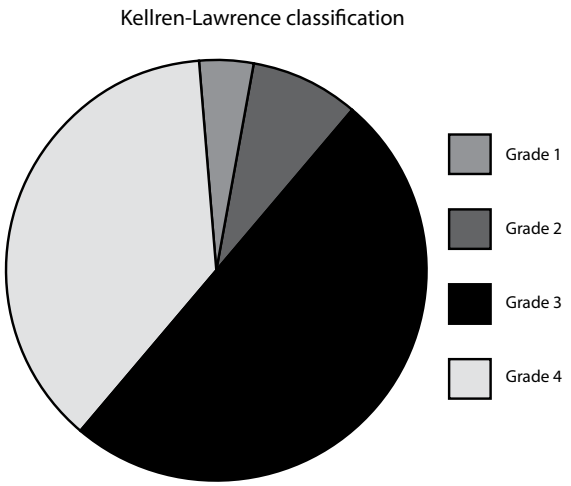
RESULTS

One thousand three hundred and ninety one new patients with complaints of LBP were seen during the study period with 160 of them diagnosed with LDDD. The adult patients with LDDD were 64 males and 96 females, with a male to female ratio of 1:1.5 and incidence of 11.5%. The age range was between 31 to 60 years with a mean age of 45.50±14.50 years. Lagos residents among them were 88.1% while 11.9% resided outside Lagos. The duration of the symptoms varied from 1 to 14 years with a mean symptoms duration of 4.46 years. One hundred and thirty seven patients (85.6%) presented in clinic while 23 patients (14.4%) presented to Emergency Room. The levels of the lumbar IVD involved were L4/L5 (59.6%), L5/S1 (18%), T12/L1 (7.2%), L1/L2-L2/L3 (6.1%), T12/L1 to L5/S1 (5.4%) and L3/L4 (3.7%). Eighty nine patients (55.6%) had spondylolisthesis of which

78.7%, 10.3%, 7.2% and 3.8% were located at L4/L5, L5/S1 and other lumbar IVDs respectively.

Figure 1

Distribution of the patients according to the Kellgren-Lawrence radiological grading



Key

- Grade I: Minimal anterior osteophytosis
- Grade II: Definite anterior osteophytosis, possible disc space narrowing, some sclerosis of the vertebral endplates
- Grade III: Moderate disc space narrowing, definite sclerosis of the vertebral endplates, osteophytosis
- Grade IV: Severe disc space narrowing, sclerosis of the vertebral endplates, large osteophytes

Comments

1. One-half (50%) of the participants had grade III Kellgren-Lawrence Classification
2. 5.6% of the participants had grade I Kellgren-Lawrence Classification
3. None of the participants had grade 0 Kellgren-Lawrence Classification

The distribution of the clinical symptoms and signs is shown in Table 1.

Table 1

Distribution of clinical symptoms and signs in adult patients with LDDD at presentation

Clinical symptoms and signs	Patient with symptoms	Patient without symptoms	Total
Altered sensation in lower limb	159	1 (0.6%)	160
Decreased/absence of Achilles tendon reflex	70	90 (56.3%)	160
Weakness/loss of toe extension	57	103(64.4%)	160
Weakness/ loss of toe flexion	58	102(63.8%)	160
Weakness/ loss of ankle plantar-flexion	45	115(71.9%)	160
Weakness/loss of ankle dorsi-flexion	41	119(74.4%)	160
Weakness/loss of knee extension	34	126(78.8%)	160
Weakness/loss of knee flexion	36	124(77.5%)	160
Weakness/loss of hip flexion	27	133(83.1%)	160
Weakness/loss of hip extension	32	128(80.0%)	160
Loss of sphincteric control	19	141(88.1%)	160
Worsened LBP at rest	72	88(55%)	160
Worsened pain with movement or Lumbar Spine ROM	140	20(12.5%)	160
Sciatic stress test	110	50(31%)	160
Femoral nerve stress test	82	78(49%)	160
Patient with unilateral radiculopathy	20	1 (0.6%)	160
Patient with bilateral radiculopathy	139	1(86.9%)	160

Key:

- Almost all the patients had altered sensation symptoms
- Bilateral radiculopathy was noted in 86.9% of the patients

The specific plain radiographic and MRI imaging findings in the patients are shown in Table 2.

Table 2

The imaging findings in adult patients with LDDD

Lumbar imaging findings			Total
Plain Radiographs	Osteophytosis		160
	Facet joint OA		142
	Spondylolisthesis		89
	Kyphosis		27
	Scoliosis		22
	Vertebral height reduction		19
MRI	Modic changes	Type 1	17
		Type 2	48
		Type 3	95
	Bulging of annulus fibrosus		131
	Central canal stenosis		139
	Roo/lateral recess stenosis		95
	Thickened/hypertrophied ligament flavum		103

Key:

2. Modic MRI classification of changes in Lumbar Degenerative Disc Disease

- Type 0: No Modic changes, normal anatomical appearance

- Type I: Changes represent bone marrow oedema, inflammation and appear hypointense on T1-weighted imaging (T1WI) and hyperintense on T2-weighted imaging (T2WI).
- Type II: Changes are associated with fatty replacement of normal haemopoietic bone marrow and appear hyperintense on T1WI and isointense or slightly hyperintense on T2WI.
- Type III: Changes represent subchondral bone sclerosis and appear hypointense on both T1WI and T2WI

The relationship between clinical signs and symptoms and the Modic MRI grading are shown in Table 3.

Table 3

The relationships between clinical signs/symptoms and MRI Modic grading

Clinical signs/ Symptoms		Toes flexion/extension weakness			Ankle flexion/extension weakness			Achilles tendon weakness			Loss of sphincteric control(s)		
		Yes	No	P value	Yes	No	P value	Yes	No	P value	Yes	No	p value
Modic Gradings	1	3	13	0.125	3	13	0.409	3	13	0.34	0	16	0.122
	2	10	39	0.10	8	41	0.35	17	32	1.25	3	46	0.135
	3	44	50	0.001	33	61	0.01	50	44	0.004	16	78	0.016

Key:

- There was a statistically significant relationship between the clinical signs/symptoms and Modic grade 3 (p values < 0.05)

DISCUSSION

Lumbar Degenerative Disc Disease (LDDD) is the commonest cause of low back pain globally in people aged 40 years and above, and a leading cause of disability and morbidity (9,10,14,15). The male (40%) to female (60%) ratio of 1:1.5 indicated higher incidence in women. This ratio is similar to what was reported in Benin-City by Igbinedion *et al*(16) where female: male of 1:1.4 was reported. There is significant difference in the age (31-60 years) group and gender of the patients in this study when compared to other studies done outside Nigeria where older patients were included in the study (11,12,17).

The incidence of LDDD in this study was 11.5%. This incidence is higher compared to the annual incidence of 5% found in a community based study conducted in the United States of America (11,12). This might be due to the fact that the study was conducted in a tertiary specialized orthopaedic centre at a specialized spine unit where new cases of LDDD are concentrated by inter- and intra-hospital referrals. In this study 85.6% of the patients presented at Surgical Out-Patient Department while 14.4% presented to Emergency Room unlike what was reported in Enugu, Nigeria by Eyichukwu *et al* (18) in the study where 20% of the patients presented to Emergency Room and the rest as chronic case in an out-patient clinic(18). This little difference might be as a result of their study having been done among the mixture of peasant farmers, traders and civil servants unlike this study that was conducted in Lagos amongst a population of civil servants and traders largely. However, the annual incidence of LBP in health care workers in a study conducted in Sokoto, Nigeria was 29.4% in males and 43.3% in females respectively(19). This higher incidence in Sokoto compared to what was noted in our study might be due to the fact that the diagnosis of LDDD was not specifically made in Sokoto; rather the study was designed for LBP unlike our study which focused on LDDD after the diagnosis.

Andrew *et al*'s (17) study of 58,842 cases of lumbar DDD diagnosed among 14,071,570 serving persons in the U.S. Armed Forces from 1999–2008 showed incidences which depend on multiple factors. The overall incidence of lumbar DDD was 4.18 while the incidence in women (4.31), men (4.16), among white service members (4.34) the blacks (3.84) respectively. Also the incidence of lumbar DDD varies with the military rank: junior enlisted (1.99), senior enlisted (6.36) while the incidences in the four armed services were 5.67 for the Army, 3.02 for the Navy, and 4.09 and 2.62 for the Air Force and Marine, per 1000 respectively (17). The patient's occupation was not considered in our study as a factor and the higher incidence in our study might be because it was conducted in a referral unit in a referral hospital where a tendency of concentrated number of this condition is found.

The altered sensation symptoms were the commonest and noted in 99.4% of the participants. This is followed by worsened pain with movement (lumbar spine ROM) which was noted in 87.5%

of the participants. Impaired or complete loss of either faecal and/or urinary sphincter control was noted in 11.9% of the participants. Most (85.6%) participants had bilateral radiculopathy (radiating pain) symptoms. The neurological deficits (complications) may be as a result of stenosis of spinal canal or foraminae or both (86.9% of the participants had central canal stenosis Table 1) in the pathology. This may have direct or indirect effects on the nerves in the lumbar canal before exiting the canal.

The levels of the lumbar IVD most involved in LDDD were L4/L5 (59.6%) and L5/S1 (18%) while 55.6%) of the patients had spondylolisthesis and 78.7% of these spondylolisthesis was located at L4/L5. These levels are similar to Eyichukwu and Ogugua (18) findings in Enugu where they reported L4/L5 and L5/S1 as the most spinal segment involved. Andrew *et al* (17) in Australia reported prevalence of severe intervertebral disc degeneration being lowest at L1/2 (4.2 %) but increased caudally (L2/3 11.1 %, L3/4 15.3 %, L4/5 31.9 %, L5/S1 30.6 %) with most frequency noted at lumbosacral level. Anatomically, spinal segments L4/L5 and L5/S1 being a junction between very mobile lumbar and a non-mobile sacral region and also the facet joints at L4/L5 are more sagittally oriented with more ease of listhesis and also being the segment bearing the most stress. These might be the reasons for higher frequency of this pathology in these regions.

Imaging findings in this study showed that all the participants have osteophytosis and reduced or obliterated IVD spaces (Table 2). Bulging annulus fibrosus and hypertrophied ligamentum flavum, canal stenosis and Modic changes were significantly present among the participants. Other imaging findings were significantly noted with the least being vertebral height reduction in 11.9% of the patients. In our study, there was no statistically significant relationship between the clinical signs/symptoms and Modic grades 1 and 2 (p values> 0.05) while Modic grade 3 showed statistically significant relationships with the clinical signs/symptoms (p values< 0.05). Unlike Andrew *et al*'s (17) study in Australia where the prevalence of Modic changes type 2 was low at the L1/2 vertebral level (5.6 %) but increased caudally (L2/3 11.1 %, L3/4 22.2 %, L4/5 29.2 %, L5/S1 23.6 %) with most noted at lumbosacral levels and no participants demonstrated a Modic type 3 change while the prevalence of Modic type 1 change was (low) not statistically significant. This could be that the Australian patients presented for the specialist care earlier (before the pathology was advanced) than patients in our study. From our findings it appears that most of our patients present to hospital late with advanced manifestation of the disease with the untoward signs, symptoms and Modic changes as described above. This was alluded to by the average duration of disease before presentation of 4.46 years in our study and Modic stage 3 changes. The pathological changes noted on MRI scan of patients with low back pain in a study by Irurhe *et al* (21) in Lagos University Teaching Hospital, correlate with the symptoms in the patients. The findings noted by Irurhe *et al* (21) were disc desiccation in 178 (66%), disc height reduction 167 (62%) and disc herniation 162 (59.7%), posterior protrusion 149 (55%), posterior extrusion 68 (25%), postero-lateral osteophytes 81(30%) and spinal stenosis 74 (27.5%). Modic grading of the pathological changes was not used by Irurhe *et al* (21) unlike in our study, however both studies showed pathological changes of advanced stage of lumbar DDD which are in keeping with late presentation of the patients. This similarity of correlation of MRI findings with symptoms severity might be due to the fact that the two studies were done in the same city.

CONCLUSIONS

The annual incidence of LDDD in the population under study was 11.5%, with the common clinical sign and symptoms being altered sensation and radicular signs amidst other late signs and symptoms. Our study also found a statistically significant relationship between Modic grade 3 change and weakness of toe flexion/extension, ankle flexion and extension, Achilles tendon and loss of sphincteric control. We therefore recommend that patients presenting to hospitals with LDDD should be thoroughly investigated and treated timely and adequately as they mostly present late with overt signs and symptoms.

Limitations of the study: This was a single-centred study done in a tertiary orthopaedic centre which receives a higher number of people with the pathology in the community. A multi-centred study or a community-based study with a higher sample size will be more statistically significant for the conclusion. Not all patients with the diagnosis consented to participate in the study and this may also affect the sample studied even though adequate counseling was done to enlighten the participants but the few ones who could not participate due to logistics (like time pressure from patient or patient's relatives) were exempted.

Declarations

Competing interest: There is no competing interest to be declared by authors.

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