

## Original Research Article

# Epidemiology of lumbar disc herniations in adults with low back pain in Enugu, Nigeria

Godson E. Anyanwu<sup>1</sup>, Remigius T. Ekwunife<sup>2\*</sup>, Emmanuel C. Iyidobi<sup>2</sup>,  
Cajetan U. Nwadinigwe<sup>2</sup>, Henry C. Ekwedigwe<sup>3</sup>, Augustine U. Agu<sup>1</sup>, Emmanuel O. Agbo<sup>2</sup>

<sup>1</sup>Department of Anatomy, College of Medicine, University of Nigeria, Enugu Campus, Nigeria

<sup>2</sup>Department of Orthopedics and Traumatology, National Orthopedic Hospital, Enugu, Nigeria

<sup>3</sup>Department of Orthopedic Surgery, Enugu State University Teaching Hospital Parklane, Enugu Nigeria

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### \*Correspondence:

Dr. Remigius T. Ekwunife,

E-mail: [remyclassic@yahoo.com](mailto:remyclassic@yahoo.com)

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## ABSTRACT

**Background:** Lumbar intervertebral disc herniation is used to describe a spectrum of anatomical abnormalities involving disc extension beyond the interspace. It follows a tear in the annulus fibrosus of the intervertebral disc. It is one of the most common causes of low back pain among adults. The study aims to assess the epidemiological pattern of lumbar disc herniations among adults with low back pain in Enugu urban.

**Methods:** The study was a prospective study at National Orthopedic Hospital Enugu and Annunciation Specialist Hospital Enugu. Following ethical approval and written informed consent, patients who met the inclusion criteria were consecutively recruited. The MRI scans of the participants were viewed using DICOM® (Digital Imaging and Communications in Medicine) software on laptop computer. The data included the patients' demographics, functional disability index for back pain, weight, height, the anatomical level(s) and site(s) of the herniated disc among other parameters.

**Results:** A total of 81 subjects who met the inclusion criteria were included and analyzed using SPSS version 20.0. The mean age of the subjects is 52.99±13.13 years. The most common affected age group is 51-60 years (27.2%). Majority of the subjects (68; 84%) had multiple level herniations which usually includes L4 level(74; 91.4%).

**Conclusions:** That multilevel lumbar disc herniation is far more common than single level herniation with a prevalence of 84% among adults with low back pain in Enugu urban. That, there is statistically significant association of lumbar disc herniation and increasing age.

**Keywords:** Epidemiology, Lumbar disc herniation, Low back pain, Adults, Nigerians

## INTRODUCTION

Lumbar intervertebral disc herniation is anatomical abnormality in which a tear in the outer fibrous ring (annulus fibrosus) of an intervertebral disc allows the soft central portion (nucleus pulposus) to be extruded to the outside of the disc.<sup>1</sup> Disc herniation is used to describe a wide spectrum of abnormalities involving disc extension beyond the interspace, from a bulge to a frank extrusion and sequestration.<sup>2</sup> It is due to the degeneration of the

intervertebral disc. It is one of the most common causes of low back pain (LBP) among adults.<sup>3</sup> Low back pain with or without lower extremity symptoms is the most common problem among individuals with chronic pain disorders with significant economic, social and health impact.<sup>4</sup> Low back pain is defined as pain that is perceived as arising in the region bounded by the 12th rib and the inferior gluteal folds; and may be associated with or without leg pain.<sup>5</sup> The onset of the back pain most often occurs between the ages of 30-50years.<sup>6</sup> Most of the

studies based the diagnosis of the problem on patient reported symptom.<sup>7</sup> Some of the factors attributable to lumbar disc herniation include obesity, smoking, physical inactivity and trauma.<sup>8</sup> Patients with disc herniation most commonly present with low back pain radiating to limbs, which increases with activity and relieved with rest. In some cases, they may present with bladder dysfunction in the form of voiding difficulties or with foot drop. The investigation of choice for suspected lumbar disc herniation is magnetic resonance imaging (MRI).<sup>9</sup> Low back pain constitutes a major health problem with high prevalence. Majority (90-97%) of the disc herniation occurs at L4-L5 and L5-S1 levels and also in males.<sup>10</sup> Less than 5% of all disc herniation occur at the upper lumbar vertebral segment.<sup>11</sup> The general aim of this study is to assess the epidemiological pattern of lumbar disc herniations among Nigerian adults with low back pain in Enugu urban. Enugu is the capital city of Enugu state, one of the five South-Eastern States in Nigeria. It has an estimated population of about 722,664 people according to the 2006 Nigerian population census.<sup>12</sup> The population of Enugu is predominantly Christian. It has a total area of 113 km<sup>2</sup>, located on 60 30<sup>1</sup>N and 70 30<sup>1</sup> E co-ordinates and about 223m above sea level.<sup>13</sup>

**METHODS**

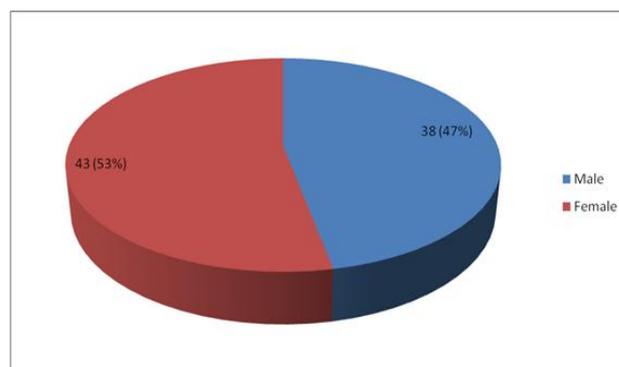
The study was a clinically based prospective cross sectional study conducted at National Orthopedic Hospital Enugu and Annunciation Specialist Hospital Emene Enugu over a 12-month period (January 2017 to December 2017). Written informed consent was obtained from all the participants. The inclusion criteria were Nigerian adults 18 years and above who had low back pain and have done lumbosacral spine MRI scan depicting lumbar disc herniation(s). Those who had traumatic spinal cord injury with paraplegia and those who had previous lumbar spine surgery were excluded. Adults who met the inclusion criteria were consecutively recruited. The standardization of the MRI findings was ensured by using only MRI scans performed with at least 0.35 Telsa units MRI machine, viewing the MRI using the Digital Imaging and Communications in Medicine (DICOM) software on windows® 7 laptop computer and finally cross checking the findings with the accompanying radiologist report. The data were collected using well designed and structured proforma and The revised Oswestry disability index (RODI) questionnaire. The data included the patients’ demographics (age, sex, and occupation), the patients’ functional disability index for low back pain, the patients’ weight and height, the anatomical level(s) and site(s) of the herniated disc material on magnetic resonance images, number of affected levels and duration of the low back pain. The patients’ body mass index (BMI) were categorized as follows; underweight <18.5 kg/m<sup>2</sup>, normal 18.5–23.0 kg/m<sup>2</sup>, overweight 23.0–27.5 kg/m<sup>2</sup> and obese >27.5 kg/m<sup>2</sup>. The data generated were presented in texts, tables, figures and graphs. The data collated were coded, entered and analysed with electronic computer software,

statistical package for social science (SPSS) version 20.0. Descriptive statistics which includes frequency, percent, mean and standard deviation were used to summarize categorical and continuous variables. Associations between categorical variables were analysed using chi-square and Fisher’s exact tests of significance. Student’s t-test was used to compare means of continuous variables. All tests were regarded as significant at p values <0.05 level of significance.

**RESULTS**

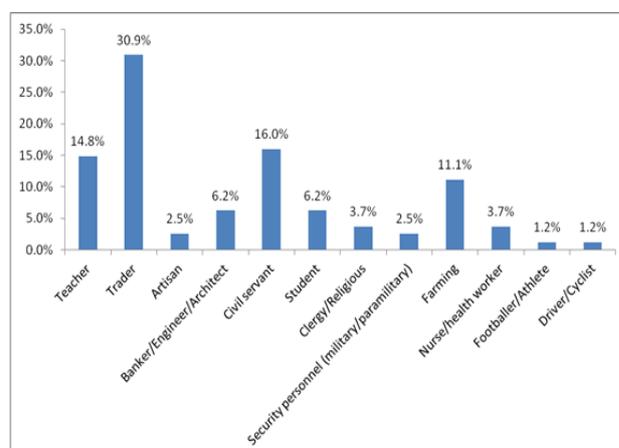
A total of 81 subjects who met the inclusion criteria were included in the study and analyzed. The age range of the subjects is 23-78 years with a mean age of 52.99±13.13 years. Majority of the subjects (73; 90%) had no family history of low back pain. The RODI score (severity of the lumbar disc herniation) was not significantly associated with the subject’s BMI (p=0.764).

Figure 1 shows that slightly higher proportions were females 43 (53%) with a male to female ratio of 1:1.1.



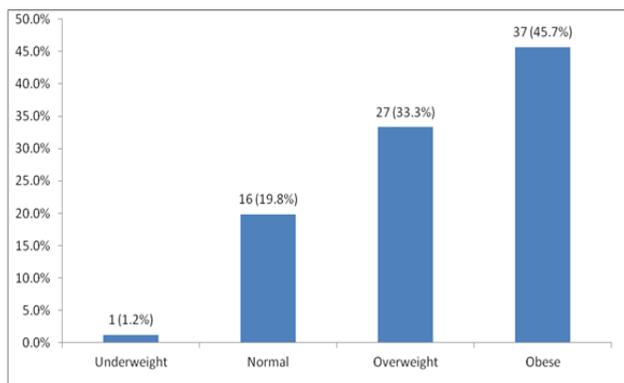
**Figure 1: Sex distribution of the subjects.**

Figure 2 shows that the most common affected subjects were traders (25; 30.9%) followed by civil servants (13; 16.0%).



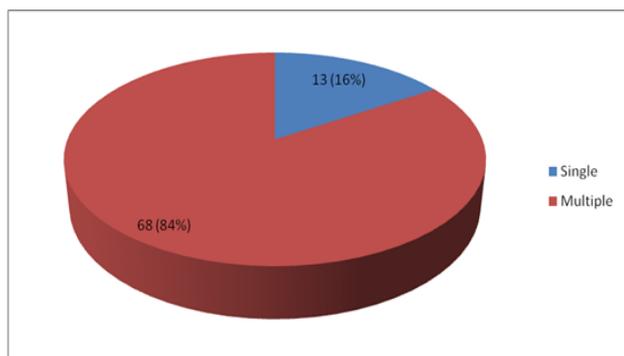
**Figure 2: Occupation of the subjects.**

Figure 3 shows that majority of the subjects (64; 79.0%) were either overweight or obese.



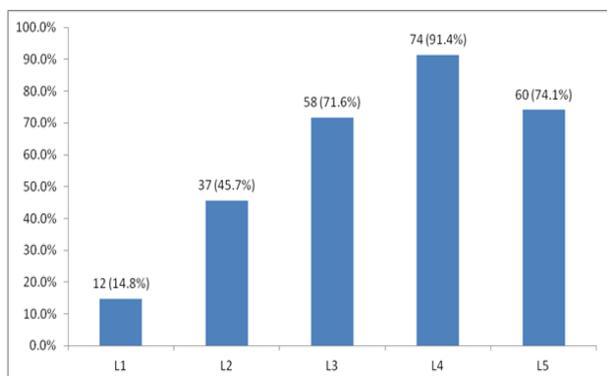
**Figure 3: Distribution of the BMI categories of the subjects.**

Figure 4 shows that majority of the subjects (68; 84%) had their herniations at more than one lumbar intervertebral disc level.



**Figure 4: Single anatomic level versus multiple anatomic levels of lumbar disc herniation(s) in the subjects.**

Figure 5 shows that majority of the subjects (74; 91.4%) had disc herniation at the fourth lumbar (L4) anatomic level.



**Figure 5: Distribution of the anatomic levels of lumbar disc herniations in the subjects.**

Table 1 shows that the most common affected age group is 51-60 years.

Table 2 shows that the most common anatomic sites are central (22; 27.7%) and paracentral (22; 27.2%) sites closely followed by the combinations of central and foraminal sites (16; 19.8%).

Table 3 shows that majority of the subjects have moderate to severe (50; 61.8%) disability index.

**Table 1: Age distribution of the subjects.**

| Age (years) | Frequency | %    |
|-------------|-----------|------|
| 21-30       | 5         | 6.2  |
| 31-40       | 9         | 11.1 |
| 41-50       | 21        | 25.9 |
| 51-60       | 22        | 27.2 |
| 61-70       | 17        | 21.0 |
| 71-80       | 7         | 8.6  |

**Table 2: Distribution of patterns of anatomic sites of disc herniations within the spinal canal in the subjects.**

| Anatomic site of disc herniation(s) | Frequency | %    |
|-------------------------------------|-----------|------|
| Central                             | 22        | 27.2 |
| Paracentral                         | 22        | 27.2 |
| Subarticular                        | 11        | 13.6 |
| Paracentral/subarticular            | 1         | 1.2  |
| Central/foraminal                   | 16        | 19.8 |
| Central/paracentral                 | 3         | 3.7  |
| Paracentral/foraminal               | 6         | 7.4  |

**Table 3: Distribution of the subjects' revised Oswestry disability index.**

| Disability index category | Frequency | %    |
|---------------------------|-----------|------|
| Minimum                   | 4         | 4.9  |
| Moderate                  | 16        | 19.8 |
| Severe                    | 34        | 42.0 |
| Crippled                  | 14        | 17.3 |
| Bed bound                 | 13        | 16.0 |

Table 4 shows that although the number of subjects who are overweight or obese that have disc herniations at different anatomic levels were higher than those who were underweight or have normal weight but it was not statistically significant ( $p > 0.05$ ). Therefore, lumbar disc herniation at all levels was not dependent on BMI.

Table 5 shows that there is statistically significant difference in the severity of lumbar disc herniation (RODI score) at L4 anatomical level of the disc herniation ( $p = 0.022$ ) compared to other levels. This implies that disc herniation at L4 level is associated with more functional disability when compared to other levels.

**Table 4: Association of anatomic level of lumbar disc herniation with the BMI categories of the subjects.**

| Level of lumbar disc herniation | BMI categories       |                 |                     |                | $\chi^2$ | P value |
|---------------------------------|----------------------|-----------------|---------------------|----------------|----------|---------|
|                                 | Underweight<br>N (%) | Normal<br>N (%) | Overweight<br>N (%) | Obese<br>N (%) |          |         |
| <b>L1</b>                       |                      |                 |                     |                |          |         |
| Present                         | 0 (0.0)              | 1 (6.3)         | 6 (22.2)            | 5 (13.5)       | 2.328    | 0.507   |
| Absent                          | 1 (100.0)            | 15 (93.8)       | 21 (77.8)           | 32 (86.5)      |          |         |
| <b>L2</b>                       |                      |                 |                     |                |          |         |
| Present                         | 1 (100.0)            | 6 (37.5)        | 13 (48.1)           | 17 (45.9)      | 1.688    | 0.640   |
| Absent                          | 0 (0.0)              | 10 (62.5)       | 14 (51.9)           | 20 (54.1)      |          |         |
| <b>L3</b>                       |                      |                 |                     |                |          |         |
| Present                         | 1 (100.0)            | 10 (62.5)       | 19 (70.4)           | 28 (75.7)      | 1.371    | 0.712   |
| Absent                          | 0 (0.0)              | 6 (37.5)        | 8 (29.6)            | 9 (24.3)       |          |         |
| <b>L4</b>                       |                      |                 |                     |                |          |         |
| Present                         | 1 (100.0)            | 15 (93.8)       | 25 (92.6)           | 33 (89.2)      | 0.483    | 0.923   |
| Absent                          | 0 (0.0)              | 1 (6.3)         | 2 (7.4)             | 4 (10.8)       |          |         |
| <b>L5</b>                       |                      |                 |                     |                |          |         |
| Present                         | 1 (100.0)            | 13 (81.3)       | 17 (63.0)           | 29 (78.4)      | 2.872    | 0.412   |
| Absent                          | 0 (0.0)              | 3 (18.8)        | 10 (37.0)           | 8 (21.6)       |          |         |

**Table 5: Association of severity of lumbar disc herniation (RODI score) and anatomical level of the disc herniation.**

| Level of lumbar disc herniation | RODI score<br>Mean±SD | t     | P value |
|---------------------------------|-----------------------|-------|---------|
| <b>L1</b>                       |                       |       |         |
| Present                         | 54.50±15.28           | 0.206 | 0.838   |
| Absent                          | 55.91±22.88           |       |         |
| <b>L2</b>                       |                       |       |         |
| Present                         | 55.29±16.51           | 0.153 | 0.879   |
| Absent                          | 56.05±25.69           |       |         |
| <b>L3</b>                       |                       |       |         |
| Present                         | 54.03±19.68           | 1.093 | 0.278   |
| Absent                          | 59.91±26.59           |       |         |
| <b>L4</b>                       |                       |       |         |
| Present                         | 54.00±21.35           | 2.345 | 0.022   |
| Absent                          | 73.74±20.15           |       |         |
| <b>L5</b>                       |                       |       |         |
| Present                         | 56.20±22.29           | 0.344 | 0.732   |
| Absent                          | 54.29±20.99           |       |         |

**DISCUSSION**

This was a clinically based prospective cross sectional study on lumbar disc herniations among adults presenting with low back pain. It highlights the socio-demographic characteristics of the subjects, the anatomic levels and anatomic sites of lumbar disc herniation(s) within the spinal canal and the prevalence of multiple level lumbar disc herniations. Lumbar disc herniations were found to occur most commonly within the age bracket of 41–70 years with a peak age of 51–60 years. This is similar to the findings by.<sup>14-18</sup> However, it differed from those by Asghar et al in Peshawar and Abidi et al that both reported peak age range of 31–50 years in their respective studies.<sup>6,9</sup> These differences are probably due to the influence of the population being studied.<sup>8</sup> Similarly, the

mean age of affected subjects of 52.99±13.13 years found in the study agrees with the average age of 65years reported by Daoyou et al in their study.<sup>14</sup> The study also found slightly female preponderance with male to female ratio of 1:1.1 which differed from the male preponderance reported by Uduma et al in their series.<sup>19</sup> This difference is probably due to the higher BMI values of the female subjects studied compared to that of the males in our locality. The most commonly affected subjects were traders (30.9%) followed by civil servants (16.0%) while the least affected subjects were footballers, athletes, drivers and cyclists (1.2%). This agrees with the findings reported by Orege et al, Frymoyer et al and N’ Gbesso et al who noted lumbar disc herniations with low back pain more in subjects that live sedentary lifestyle and those whose work required limited physical stress in the lumbosacral spine.<sup>20-22</sup> It also agreed with the report

by Orthoinfo that noted regular exercise to be important in preventing lumbar disc herniation.<sup>23</sup> Furthermore, the study found majority of the subjects studied to have associated symptoms of sciatic (96.3%) or tingling sensation (95.1%) in the leg and/or foot. This agrees with the findings reported by other researchers in their series.<sup>5,24-26</sup> Majority (90%) of the subjects studied had no family history of similar problem. The prevalence of multiple anatomic levels lumbar disc herniations of 84% on MRI found in the study is similar to that reported by Irurhue et al in their study at radiodiagnosis department of Lagos University Teaching Hospital (LUTH), Idi Araba, Lagos.<sup>27</sup> The most common anatomic level of lumbar disc herniation found in the study is at L4/L5 level (74; 91.4%) followed by L5/S1 level (60; 74.1%). This is also similar to that reported by Irurhue et al in their study in Lagos South West, Nigeria.<sup>27</sup> It also agrees with the rate of 96% at L4/L5 level noted by Rehman et al and higher rate at L4/L5 followed by L5/S1 reported by Orege et al.<sup>20,28</sup> Also similar to that reported by Uduma et al with 2.5% at L4/L5 and L5/S1 anatomic levels each respectively.<sup>19</sup> However, this differed from the findings of most common anatomic level of disc herniation at L5/S1 (52.6%) followed by L4/L5 (39.5%) reported by Asghar et al.<sup>9</sup> The study equally found the most common anatomic site of the disc herniation within the spinal canal to be central (27.2%) and paracentral (27.2%) positions. This is similar to that reported by Daghighi et al.<sup>29</sup> The moderate to severe functional disability index in the majority of the subjects (50; 61.8%) at the time of presentation to the hospitals found in the study is similar to that also reported by Uduma et al.<sup>19</sup> The study also found no statistically significant association of L1, L4 and L5 disc herniations with age, gender and occupation. However, it found that L2 and L3 disc herniations were significantly associated with age and also that L3 disc herniation was significantly associated with the subject's occupation ( $p < 0.05$ ). It noted that majority of the subjects with L3 disc herniation were teachers, traders and civil servants with sedentary lifestyle and those whose occupations involve limited physical stress in the lumbosacral spine. This agrees with the finding by Drammers and Kochler that reported a strong correlation between the level of lumbar disc herniation and increasing age.<sup>30</sup> They noted that with increasing age, lumbar disc herniation is more cranially localized in the lumbar spine. However, the finding differed from that reported Daoyou et al who noted that the most common site is towards the bottom of the spine at L4/L5 and/or L5/S.<sup>14</sup> This difference is probably due to the influence of the population being studied. Similarly, the finding of no statistically significant association of gender with the level of lumbar disc herniation in the study also agrees to that reported by Asghar et al in their series.<sup>9</sup> There was no statistically significant association between the anatomic level of the disc herniation and the subject's BMI noted in the study. This agrees with the finding by Smartzis et al who reported elevated BMI to be significantly associated with disc herniation at any anatomic level but not at a particular anatomic level.<sup>26</sup> It is also similar to the finding by Robert et al that reported

BMI  $> 27.5 \text{ kg/m}^2$  as an independent factor for the occurrence of lumbar disc herniation at any anatomic level.<sup>31</sup> The study also found that the Revised Oswestry Disability Index (RODI) score was significantly associated with lumbar disc herniation at L4 anatomical level when compared to other levels. The study found that lumbar disc herniation at L4 anatomic level is significantly associated with more functional disability when compared to other levels ( $p = 0.022$ ). Similarly, the study found that the functional severity of low back pain in the subjects is not significantly associated with the number of levels involved ( $p = 0.380$ ).

## CONCLUSION

From the results of this study, the following conclusions were made: that the prevalence of multilevel intervertebral lumbar disc herniation among Nigerian adults with low back pain in Enugu urban is 84%, that intervertebral lumbar disc herniation is commoner amongst subjects who live sedentary lifestyle such as traders and civil servants, that the most common anatomic level of lumbar disc herniation among Nigerian adults with low back pain in Enugu urban is L4/L5 intervertebral disc, that the most frequent pattern of anatomic site of lumbar disc herniation within the spinal canal among Nigerian adults with low back pain in Enugu urban is central or paracentral herniation and that there is statistically significant association of lumbar disc herniation and increasing age.

## Recommendation

It is therefore recommended that sedentary lifestyle should be avoided to prevent lumbar disc herniation and consequent low back pain in adults. However, it is noted that the study only involved selected cohort of adult patients with low back pain who could afford MRI scan thereby limiting the sample size for the study.

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