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PREVALENCE OF LUMBAR DISC HERNIATION AND DISC DEGENERATION IN ASYMPTOMATIC INDIAN SUBJECTS: AN MRI BASED STUDY

[1]Dr. Bhagya Lakshmi Bommineni, [2]Dr. Prasanthi Meesala.

[1,2]Assistant Professor, Department of Radiology, Guntur Medical College, Guntur, Andhra Pradesh, India.

Corresponding Author:

Dr. Manasa Pitta, Assistant Professor, Department of Radiology, Guntur Medical College, Guntur, Andhra Pradesh, India.

Email: bhagya2001@gmail.com

Abstract:

Background:

India, with its vast human resource base and diverse cultures and religions, engages in numerous activities that require the spine to bend and twist, leading to increased disc degeneration and disc herniation compared to the West. The Indian healthcare system uses both contemporary and traditional medicines, including Magnetic Resonance Imaging (MRI), which can show physiological and pathological changes. However, this accessibility could potentially mislead less skilled healthcare providers and negatively affect a healthy person's mental state.

***Aim*:**

Examine lumbar disc degeneration and herniation prevalence in asymptomatic Indian subjects by means of magnetic resonance imaging.

Materials and Methods:

In this observational study, participants without any low back-related complaints or indicators were chosen, and they were subjected to a 1.5 Tesla lumbar spine MRI screening.

Results:

A study of 380 discs with 76 participants found that 28.2% of them had pathological changes, including bulges (17.8%), protrusions (7.8%), and extrusions (2%). Of these, 71.8% were normal, and no subject experienced sequestration. Of the disc degeneration, 66.3% belonged to Grades 1 and 2, and 32.7% to Grades 3 through 5. Of the 76 participants, 33% had degeneration in Grades 3, 4, and 5, and 37% had disc herniation.

Conclusion:

The high frequency of disc herniation and degeneration in normal people's MRI highlights the need of a clinical history and examination before beginning an expensive course of treatment.

Keywords:

Asymptomatic subjects, Disc degeneration, herniation, MRI.

Introduction:

Lumbar discomfort affects 30-40% of people in Germany, with one-year and lifetime prevalences of 60-70% and over 80%, respectively.

A Korean study found that 81.4%, 76.1%, and 75.8% of asymptomatic participants had disc herniation, annular fissure, and disc degeneration, respectively. These can be mechanical, physiological, or both. In sitting and standing positions with 20 degrees of flexion, strain on the lumbar disc can exceed 250% of the body weight.

In India, activities such as bending and twisting the spine, cleaning floors, squatting in lavatory, eating meals on the floor, and adopting religious postures may contribute to a higher incidence of asymptomatic disc degeneration and herniation than in the Western population.

Unfortunately, there is no Indian data available in published works, and less skilled healthcare providers may be misled by an MRI's portrayal of both physiological and pathological changes, potentially negatively affecting an otherwise healthy person's emotional state. The authors aimed to examine the frequency of lumbar disc degeneration and herniation in asymptomatic Indian people.

Materials and Methods:

The study involved patients aged 20-60 years who visited a hospital between January and December 2023 for back discomfort, leg pain, paraesthesia, and weakening in lower limb muscles.

Asymptomatic subjects were those who answered negatively on the questionnaire, had never visited a healthcare provider, and had never missed work due to a low back ache or associated symptoms.

Disc degeneration and disc herniation were examined using MRI images, with disc herniation categorized into four categories based on the posterior longitudinal ligament's integrity.

Exclusion criterion: Cases where hospitalization was necessary due to trauma, such as traffic accidents, as these cases may have concealed lumbar illnesses.

Using a 1.5 Tesla Philips machine, patients underwent MRIs. T2 sequences were used to capture five sagittal images: two on the right side, one on the midline, and two on the left.

Disc degeneration was categorized into five classes using Pfirrmann's grading system. On T2WI grade 1 disc is hyper-intense, grade 2 isointense, grade 3 moderate, grade 4 intermediate to hypo-intense, and grade 5 hypo-intense.

The total number of normal individuals involved in the study was split into five levels (L1/L2, L2/L3, L3/L4, and L5/S1) and four age groups (A) 20–29, (B) 30-39, (C) 40–49, and (D) 50–60. Microsoft Excel was used for data entry, and SPSS statistical software was used for analysis. All relevant variables were given simple proportions, and the prevalence of disc degeneration and herniation was evaluated.

* **The study has no outside support.**
* **None of the authors have any conflicts of interest.**

Results:

The study screened 120 people, with a mean age of 43.7 with a standard deviation of 11.4 (Table 1) and a high participation rate in the 50-60 age group. 380 discs were examined for disc degeneration and herniation, with 256 (67.3%) belonging to Grades 1 and 2, and 124 (32.7%) to Grades 3 through 5.

Among disc herniation, 28.2% displayed pathological changes in the form of bulges, protrusions, and extrusions. Of these, 71.8% were normal. Sequestration was absent from every subject (Table 2). Of the 76 individuals assessed, 67% exhibited degeneration in grades 1 and 2, and 33% had degeneration in grades 3, 4, and 5.

The study analysed the prevalence of disc herniation in 76 individuals, with varying rates in different groups. The majority (82%) had some herniation at one or more-disc levels, while 63% had no herniation at all. The majority (31%) had protrusions and disc bulges in Group A, while 19% and 9% in Group B had disc bulges. Group C had 4% extrusion, 8% protrusion, and 26% bulging, while 20%, 12%, and 7% in Group D had bulging discs. Of the participants over 40, 38% had grade 3, 4, or 5 degeneration and 38% had some type of herniation.

The sex distribution for the prevalence of degeneration and herniation was not compared because the study included more female participants than male participants. The levels for grade 3, 4, and 5 degenerations were L1/L2 (3%), L2/L3 (7.2%), L3/L4 (24%), L4/L5 (29%), and L5/S1 (33%), while L1/L2 (0%), L2/L3 (1.8%), L3/L4 (20%), L4/L5 (39%), and L5/S1 (40.9%) were the levels for herniation. The study found that a significant percentage of participants had degeneration of grade 3, 4, or 5, and some type of herniation. (Figure 1&2).

Table.1. Demographic data

Age	Number	Male	Female	Mean
A(20-29)	15	6	9	27.5
B(30-39)	11	3	8	39.8
C(40-49)	24	11	13	49.7
D(50-60)	26	10	16	57.9
Total	76	31	45	43.7

Table.2. Prevalence in various disc levels.

Level	Grade I-II	Grade III-IV	Grade V	Normal	Bulge	Protrusion	Extrusion	Sequestration
L1/L2	72	4	0	76	0	0	0	0
L2/L3	67	9	0	74	1	0	1	0
L3/L4	46	30	0	55	18	3	0	0
L4/L5	38	36	2	35	28	9	4	0
L5/S1	33	41	2	33	21	18	4	0
Total	256	120	4	273	68	30	9	0

Table 3: Prevalence in different age groups

Age	Grade I-II	Grade III-V	Normal	Bulge	Protrusion	Extrusion	Sequestration
20-29	12	3	10	3	2	0	0
30-39	8	3	7	2	1	1	0
40-49	17	7	15	6	2	1	0
50-60	14	12	16	6	3	1	0
Total	51	25	48	17	8	3	0

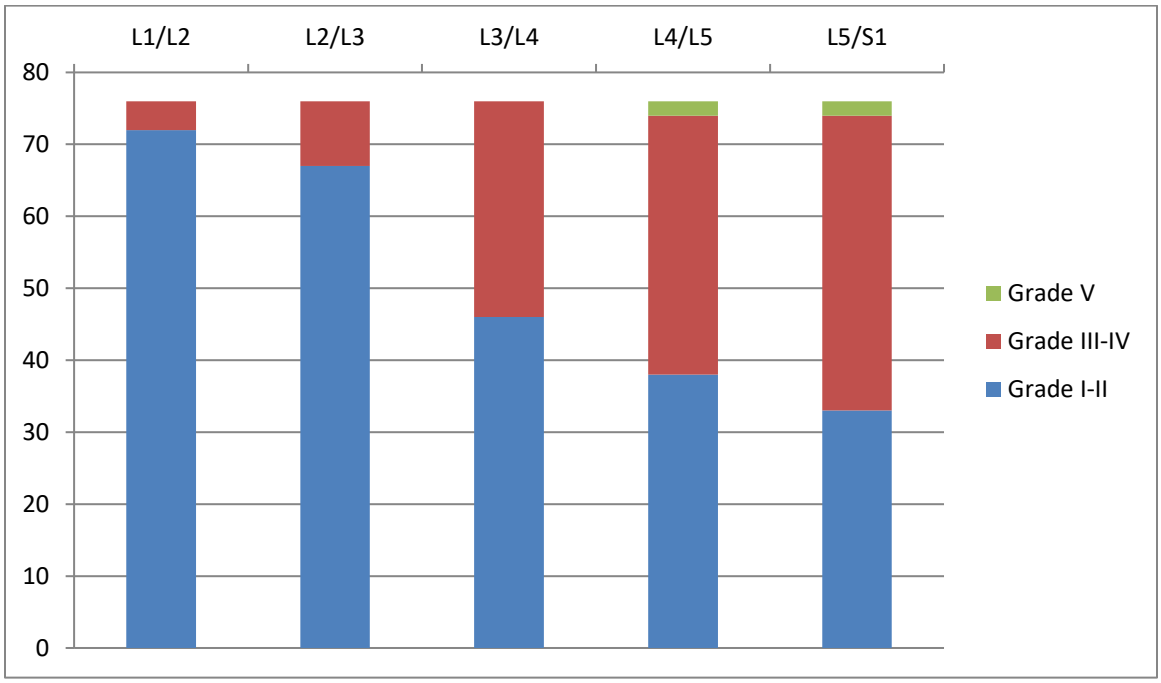

Fig 1: Grades of disc degeneration at various levels (y axis: number of subjects)

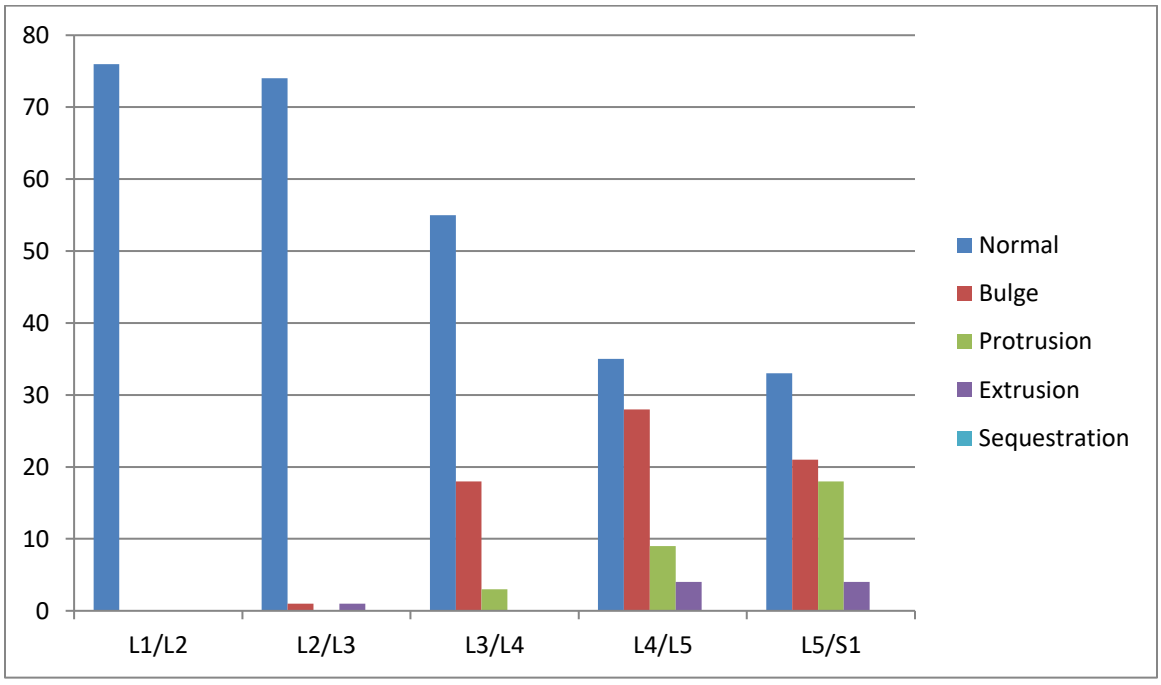

Fig 2: Types of herniation at various levels (y axis: number of subjects)

Discussion:

The fibrocartilage pads known as intervertebral discs (IVDs) are located in the space between the spine's vertebrae. They disperse compressive loading among the neighbouring vertebral bodies and permit the vertebral column to bend and twist [8].

A motion segment is made up of an IVD and two vertebrae. The three primary parts of the IVD are the soft, pliable nucleus pulposus, which is encircled by the fibrous concentric layers of the annulus fibrosus and joined to the neighbouring vertebral bodies both above and below by the thin layers of cartilaginous end plates.

Under healthy circumstances, the fiber orientation of the annulus fibrosus is appropriate to withstand hoop stresses caused by the hydrostatic pressure of the nucleus pulposus. The nucleus pulposus is assumed to be the site of the degenerative process, as evidenced by a decrease in its concentration of proteoglycans [9, 10] and a progressive transformation of Type 1 collagen into a more fibrotic Type 2 collagen [11]. The annulus fibrosus's total mechanical characteristics are significantly influenced by the configuration of its elastic fibres [12].

Degeneration preserves elastic anisotropy in the annulus, with reductions of roughly 30–50% occurring in the posterolateral and outer lamellae areas as degeneration advances [13]. Disc herniation may result from degeneration paired with severe and continuous spine motions. In contrast to the west, human labour is still more important in India than mechanical devices. Indian women typically begin their days by milking cows, cleaning the home with brooms, cooking on wood-burning stoves, and wiping off kitchen utensils while seated on the ground.

Most of the population does not utilise Western toilets; instead, squatting is typical for urinating and passing gas. Almost all Indian religions and customs include extended periods of sitting, sometimes with the legs crossed, kneeling, bowing, or some other position. India, one of the world's greatest agricultural nations, is still mostly unmodernized and relies heavily on labour from humans, which is quite taxing. Even if technology and mechanics are growing quickly in India, we still utilise manual tools to replace a punctured tube, trim trees, dig for pipes, and other tasks that are automated or semi-automated in the west.

India is known for its diversity of religions, customs, and civilizations, but it also offers a wide range of medical options, each with pros and cons, such as homoeopathy, acupuncture, siddha, naturopathy, and unani. Everybody is free to select any inquiry to include in their treatment plan. All of these practitioners, who will be following the radiologist's findings without question, have easy access to MRIs. The radiologist would often report based solely on the visuals and could not have any clinical data. This leads to either over-treating a person who would otherwise be normal. Thus, it is highly pertinent that this study sought to determine the incidence of lumbar disc degeneration and herniation in Indian participants who did not exhibit any symptoms.

The frequency of disc herniation and degeneration in different age groups ranges from 27% to 84%, according to Western literature from the United States, Europe, and Korea [2, 15, 16, 17, 18]. Grades 1 and 2 of the Pfirrmann degeneration grading system are regarded as typical [7]. Thus, 67.3% of the disc degenerations in our investigation were normal. There were no low back

complaints among the 28.2% herniated discs and 32.7% deteriorated discs. Degenerative alterations grow with age, as several studies have shown.

In our study, degeneration was observed in 18% of Group A and climbed to 47% in Group D. The highest percentages of asymptomatic individuals with MRI-diagnosed herniated discs (37%) belonged to the oldest age groups, or Groups A and D. Protrusions and asymptomatic disc bulges followed the same trend, however as people aged, more extrusions were observed, which is in Groups C and D. Neither in the Western literature nor in any of the patients in our investigation did asymptomatic sequestrated disc occur. Our study revealed more alterations in the L5/S1 level, while other studies indicated more herniation and degeneration at the L4/L5 level.

Conclusion:

The high frequency of disc herniation and degeneration in normal people' MRIs highlights the need of a clinical history and examination before beginning an expensive course of treatment. Despite a significant difference in lifestyle and habits, there is no statistically significant difference between the MRI findings of the asymptomatic western population and the Indian population, with the exception of the spinal level.

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