

Sociodemographic influences on lumbar disc degeneration severity and the diagnostic potential of disc-CSF signal ratio: Insights from a Malaysian population study

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ABSTRACT

Introduction: Lumbar disc degeneration involves structural changes and loss of water content in discs significantly impacts spinal health and quality of life. The Pfirrmann Grading System is a widely used method for assessing the severity of lumbar disc degeneration based on MRI findings. The primary objectives of this study are to investigate the relationship between sociodemographic factors (age, gender, and race) and the severity of lumbar disc degeneration based on the Pfirrmann Grading System and examine the correlation between the disc-CSF signal ratio and Pfirrmann grades to evaluate its potential as a diagnostic tool in a Malaysian population. **Material and Methods:** This retrospective cross-sectional study was conducted at Hospital Sultan Abdul Aziz Shah and included patients who underwent MRI lumbosacral spine scans between January 2022 and December 2022. Sociodemographic data and radiological images were collected, with ethical approval from the institutional review board. The Pfirrmann grading was applied to assess lumbar disc degeneration from L1/L2 to L5/S1 levels. The disc-CSF signal ratio was calculated by measuring the signal intensity of the nucleus pulposus and cerebrospinal fluid (CSF) on mid-sagittal T2-weighted images. Statistical analyses included Chi-square tests, Kruskal-Wallis, Mann-Whitney tests, and Spearman rank correlation to explore the relationships between sociodemographic factors, Pfirrmann grades, and disc-CSF signal ratios. **Results:** The study included 182 participants, with a female predominance (63.2%) and a majority of Malay ethnicity (84.1%). Age distribution showed the highest prevalence in the 60-69 age group (29.1%). The analysis revealed significant relationships between sociodemographic factors and lumbar disc degeneration. Females exhibited higher rates of moderate degeneration (Grade 3), while males showed more severe degeneration (Grades 4 and 5). Age-related trends indicated increased severity with advancing age, particularly in older age groups (60-69 and >70). Racial analysis highlighted significant differences, with Malays showing higher rates of moderate degeneration and Chinese and Indians exhibiting more severe degeneration. The disc-CSF signal ratio showed a significant inverse correlation with Pfirrmann grades ($R^2 = 0.845$), indicating its potential as a reliable diagnostic measure. **Conclusion:** This study underscores the significant impact of sociodemographic factors on lumbar disc degeneration severity. The strong correlation between the disc-CSF signal ratio and Pfirrmann grades suggests that the disc-CSF signal ratio can serve as a valuable diagnostic tool particular in Malaysia clinical settings. Early detection and targeted interventions are crucial to mitigate the progression of lumbar disc degeneration, ultimately improving patient outcomes and quality of life.