Background
- Spinal degenerative changes have been consistently associated with chronic low back pain.
- Studies have demonstrated inconsistent associations between genetic heritability and spine degeneration.

Purpose
- Elucidating the relationship between spine degeneration and genetic heritability may improve the understanding of those that develop chronic low back pain from a mechanical source.

Methods
- Databases searched Pubmed, Embase, and Web of Science on June 1, 2018.
- 6527 non-duplicate articles were screened with our inclusion/exclusion criteria.
- 24 studies were included:
  - 1 utilized a cohort analysis,
  - 16 utilized a cross-sectional analysis,
  - 7 utilized a case-control analysis.
- Newcastle Ottawa Quality Assessment:
  - 79% of studies were moderate to high quality
  - Cohort and case control: ≥ 4/9 stars
  - Cross-sectional: 4/10 stars

Inclusion Criteria
- Identified candidate genes associated with spinal degeneration.
- Observational study of a population cohort.
- Humans adults (≥18) from any race/ethnicity or gender.
- Spinal degeneration confirmed by imaging.
- Published in English.

Exclusion Criteria
- Case series and case reports.
- Cadaver studies.
- Secondary etiology of spine abnormality (infections, inflammations, ankylosing spondylitis, osteoporosis, rheumatoid arthritis, identifiable disease, or traumatic causes).

Analysis
- 15 Radiographic Features Identified
  - 10 Features of Intervertebral Disc
  - 5 Features of Vertebral Bone
- 100% of disc features had a minimum of 1 significantly associated genes and a maximum of 4 genes.
- 80% of bone features had a minimum of 1 significantly associated genes and a maximum of 4 genes.

Common Genetic Markers and Significant Associations with Spinal Degeneration
- Collagen 40%
- Insulin-like Growth Factor 26.6%
- Vitamin D 20%
- Aggrecan 20%
- Interleukin 20%

Results
- Significant Associations Between Spinal Radiographic Imaging Features and Genetic Markers

Clinical Relevance
- If a causal link between spine degeneration and genetic markers is established, it could help identify patients that are likely to experience spinal degeneration, and even clinically significant spine conditions, in their lifetime.
- Further research may allow for the creation of clinical phenotypes that would usher in an era of personalized medicine where patients are identified and offered individualized interventions for prevention and treatment.

Conclusions
- Etiology of spinal degeneration may be partially attributed to genetic factors.
- There is likely not a single gene that is responsible for spinal degeneration, but rather that several genes contribute to the degenerative changes in spinal disc and bone.
- Further research is needed to identify how genes associated with spinal degeneration impact clinical outcomes such as pain and function.

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