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Assessment of Spinal Degenerative Changes in Middle Aged Adults A Cross Sectional Study

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ABSTRACT
Spinal degenerative changes are prevalent among middle-aged adults, contributing to a significant decrease in quality of life. This cross-sectional study aims to assess the extent and patterns of these changes within this demographic. A total of 180 middle-aged adults were recruited for this study. The inclusion criteria were individuals aged 40-60 years, presenting with or without symptoms of spinal degeneration. Exclusion criteria included those with a history of spinal surgery or trauma. Data were collected through MRI imaging, physical examinations and questionnaires to assess spinal health. The study utilized descriptive statistics and logistic regression to analyze the data. Preliminary findings indicate a high prevalence of degenerative spinal changes in the population studied, with variations in severity and location. Further analysis will elucidate the factors associated with increased risk of degeneration. This study underscores the widespread nature of spinal degenerative changes among middle-aged adults and highlights the need for early detection and intervention strategies.

INTRODUCTION

Spinal degenerative changes are a significant health concern that affects a large proportion of the middle-aged population. These changes encompass a range of conditions, including disc degeneration, facet joint osteoarthritis and spinal stenosis, each contributing to the overall burden of spinal disorders in this demographic. Disc degeneration refers to the loss of the intervertebral disc's ability to absorb shock and provide flexibility, leading to reduced disc height and potentially herniation. Facet joint osteoarthritis involves the deterioration of the joints connecting the spinal vertebrae, causing pain and limiting motion. Spinal stenosis, the narrowing of the spinal canal, can compress the spinal cord and nerves, resulting in pain, numbness, or weakness in the limbs. These conditions are not only prevalent but also significantly impact individuals' daily lives, leading to pain, disability and a diminished quality of life[1].

The aging process is universally recognized as a primary driver of spinal degenerative changes. As individuals age, the cumulative effects of wear and tear on the spine become more pronounced, leading to the aforementioned conditions. However, the impact of aging is often exacerbated by lifestyle factors such as physical inactivity, obesity and smoking. Physical inactivity can lead to decreased spinal flexibility and muscle strength, increasing the risk for disc degeneration and joint issues. Obesity places additional stress on the spine, accelerating the wear on intervertebral discs and facet joints. Smoking has been shown to impair blood flow to the spinal tissues, hindering the delivery of nutrients and the removal of waste products, thereby contributing to the degenerative process[2].

Genetic predisposition also plays a crucial role in the susceptibility to spinal degenerative changes. Research has identified specific genetic markers that may increase an individual's likelihood of developing conditions like disc degeneration and osteoarthritis. This suggests that for some individuals, the risk of spinal degeneration is partly inherited, highlighting the importance of genetic factors in understanding these conditions[3].

Occupational hazards are another significant contributor to the onset and progression of spinal degenerative changes. Jobs that involve heavy lifting, repetitive motions, or prolonged sitting or standing can put excessive strain on the spine, leading to early or more severe degeneration. Workers in construction, transportation and office jobs are particularly at risk, emphasizing the need for ergonomic interventions and workplace health programs to mitigate these risks[4]. Despite the high prevalence and significant impact of spinal degenerative changes among middle-aged adults, there remains a gap in comprehensive data regarding the extent and patterns of these conditions within this demographic. This lack of data hinders the development of effective prevention and treatment strategies. Moreover, the interplay between genetic, lifestyle and occupational factors complicates the identification of individuals at highest risk and the tailoring of interventions to prevent or slow the progression of spinal degeneration[5].

Aims and Objectives: To assess the prevalence and patterns of spinal degenerative changes among middle-aged adults.

- To determine the prevalence of spinal degenerative changes in the study population.
- To identify the patterns of degenerative changes in terms of location and severity
- To explore the association between lifestyle factors and the risk of spinal degeneration

MATERIAL AND METHODS

Source of Data: The study population consists of 180 middle-aged adults recruited from outpatient clinics and community centers.

Study Design: This is a cross-sectional study designed to assess spinal degenerative changes in middle-aged adults.

Sample Size: The sample size was determined to be 180 individuals, based on previous studies indicating a sufficient number to achieve statistical significance.

Inclusion Criteria: Individuals aged 40-60 years, both symptomatic and asymptomatic of spinal degeneration, were included.

Exclusion Criteria: Individuals with a history of spinal surgery, trauma, or other conditions known to affect spinal health were excluded.

Study Methodology: Participants underwent MRI imaging to assess spinal degeneration, complemented by physical examinations and questionnaires on lifestyle and health history. The extent and patterns of degenerative changes were recorded.

Statistical Methods: Data were analyzed using descriptive statistics to summarize the characteristics of the study population. Logistic regression was employed to identify factors associated with an increased risk of spinal degeneration.

Data Collection: Data collection involved gathering participant's demographic information, health history, lifestyle factors and MRI findings. All data were anonymized to ensure participant's, privacy.

Table 1: Patterns of Degenerative Changes in Terms of Location and Severity

Location	Mild n (%)	Moderate n (%)	Severe n (%)	OR (Severe vs. Mild)	95% CI	P-value
Cervical	50 (27.8)	40 (22.2)	10 (5.6)	2.0	[1.0-4.0]	<0.05
Thoracic	30 (16.7)	25 (13.9)	15 (8.3)	2.5	[1.1-5.6]	<0.05
Lumbar	60 (33.3)	50 (27.8)	20 (11.1)	1.8	[0.9-3.6]	>0.05

Table 2: Association between Lifestyle Factors and the Risk of Spinal Degeneration

Lifestyle Factor	n (%)	OR	95% CI	P value
Physical Activity (<150 min/week)	100 (55.6)	2.0	[1.5-2.7]	<0.01
Smoking (Current smoker)	60 (33.3)	1.8	[1.2-2.6]	<0.05
Obesity (BMI ≥ 30)	80 (44.4)	2.4	[1.7-3.4]	<0.01

RESULTS AND DISCUSSIONS

(Table 1) presents the patterns of degenerative changes in the spine, categorized by location (cervical, thoracic, lumbar) and severity (mild, moderate, severe). The distribution indicates that cervical degeneration was observed in 27.8% of cases as mild, 22.2% as moderate and 5.6% as severe, with a significant odds ratio (OR) of 2.0 for severe versus mild cases, suggesting that individuals with mild cervical degeneration are twice as likely to progress to severe degeneration. This relationship was statistically significant, as indicated by a P value of less than 0.05. Thoracic degeneration showed a similar pattern, with 16.7% mild, 13.9% moderate and 8.3% severe cases and an even higher OR of 2.5, also significant. Lumbar degeneration was more common, with 33.3% mild, 27.8% moderate and 11.1% severe cases, but the OR of 1.8 for severe versus mild cases was not statistically significant (P > 0.05), indicating variability in the progression of lumbar degeneration.

(Table 2) examines the association between lifestyle factors and the risk of spinal degeneration, focusing on physical activity, smoking and obesity. Individuals engaging in less than 150 minutes of physical activity per week had a 55.6% prevalence of spinal degeneration, with an OR of 2.0, suggesting they are twice as likely to experience spinal degeneration compared to their more active counterparts. This association was statistically significant (p<0.01). Smoking was associated with a 33.3% prevalence of degeneration and an OR of 1.8, indicating a heightened risk for smokers, which was statistically significant (p<0.05). Obesity (BMI ≥30) was seen in 44.4% of cases, with the highest OR of 2.4, signifying a substantial risk increase for spinal degeneration, also statistically significant (p<0.01). These findings highlight the significant impact of lifestyle factors on the risk of developing spinal degeneration, underscoring the importance of healthy lifestyle choices in mitigating this risk.

The patterns of degenerative changes in terms of location and severity observed in our study, as detailed in (Table 1) align with the broader literature on spinal degeneration. The finding that cervical and thoracic regions are significantly associated with progression from mild to severe degeneration (with odds ratios of 2.0 and 2.5, respectively) is consistent with the work of Bissolotti *et al.*[6], who found that the cervical spine is particularly susceptible to degenerative changes due to its high mobility and the constant mechanical stress it endures. Similarly, the thoracic spine, despite being more rigid and less mobile, shows a significant propensity for degenerative changes, likely due to compensatory mechanisms for cervical or lumbar degeneration Schwartz *et al.*[7]. However, the lumbar spines progression from mild to severe degeneration did not reach statistical significance in our study, which contrasts with findings by Li X *et al.*[8], who reported a higher prevalence of severe degeneration in the lumbar region. This discrepancy may be attributed to differences in sample populations or assessment methodologies.

(Table 2)s findings on the association between lifestyle factors and the risk of spinal degeneration are corroborated by existing research. The increased risk associated with low physical activity levels (odds ratio of 2.0) echoes the conclusions of Jiang *et al.*[9], emphasizing the protective role of regular physical activity against spinal degenerative changes. The link between smoking and increased risk of spinal degeneration (odds ratio of 1.8) is supported by the findings of Chen *et al.*[10], who suggested that smoking exacerbates degenerative disc disease by reducing blood flow to the spinal discs. Lastly, the association between obesity and spinal degeneration (odds ratio of 2.4) aligns with the research conducted by Ogon *et al.*[11], indicating that excessive body weight increases mechanical stress on the spine, promoting degeneration.

These findings highlight the complex interplay between anatomical, mechanical and lifestyle factors in the development and progression of spinal degenerative changes. They underscore the importance of adopting healthy lifestyle habits to mitigate the risk of spinal degeneration, particularly in vulnerable regions such as the cervical and lumbar spine.

CONCLUSION

The cross-sectional study conducted to assess spinal degenerative changes in middle-aged adults provides significant insights into the prevalence, patterns and associated risk factors of spinal degeneration within this demographic. Our findings demonstrate a high prevalence of spinal degenerative

changes, with a notable differentiation in severity across different regions of the spine-namely, cervical, thoracic and lumbar. The analysis revealed that 83.3% of the study population exhibited some form of spinal degeneration, underscoring the widespread nature of this condition among middle-aged adults. Specifically, the cervical region was affected in 55.6% of cases, the thoracic region in 38.9% and the lumbar region in 72.2%. These findings highlight the lumbar region as the most commonly affected area, which aligns with existing literature attributing this prevalence to the lumbar spine's critical role in weight-bearing and mobility.

Moreover, our study identified significant associations between the severity of degeneration and specific lifestyle factors, including physical inactivity, smoking and obesity. Individuals engaging in less than 150 minutes of physical activity per week, current smokers and those with a body mass index (BMI) of 30 or greater were found to be at an increased risk of developing spinal degeneration. These associations emphasize the importance of lifestyle modifications as a preventative strategy against the progression of spinal degenerative changes. The statistical analysis, including odds ratios and confidence intervals, further elucidates the risk factors contributing to the progression from mild to severe degenerative changes. Particularly, the cervical and thoracic regions showed a statistically significant increase in the odds of progressing from mild to severe degeneration, reinforcing the need for early detection and intervention in individuals displaying early signs of degeneration in these areas.

In conclusion, this study contributes valuable data to the body of knowledge on spinal degenerative changes among middle-aged adults. It underscores the high prevalence of such changes within this age group and highlights the significant impact of lifestyle factors on spinal health. The findings advocate for the implementation of public health strategies focused on promoting physical activity, smoking cessation and weight management as key components in preventing or mitigating spinal degenerative changes. Furthermore, these insights pave the way for future research aimed at exploring targeted interventions to slow the progression of spinal degeneration, ultimately improving the quality of life for affected individuals.

Limitations of Study

Cross-Sectional Design: One of the primary limitations of this study stems from its cross-sectional nature. While this design is effective for determining the prevalence of a condition at a single point in time, it does not allow for the establishment of causality. This means we cannot definitively conclude that the identified risk factors cause spinal degeneration we can only suggest associations.

Sample Size and Representativeness: Although the study included 180 participants, this sample size may not be large enough to capture the full spectrum of variability within the middle-aged adult population. Additionally, the sample may not be representative of the broader population, especially if the recruitment method introduced selection bias. For instance, participants drawn from outpatient clinics might have higher rates of spinal issues compared to the general population, potentially skewing the prevalence rates.

Self-Reported Data: The study relied on self-reported data for lifestyle factors, such as physical activity, smoking status and dietary habits. Self-reported data are subject to recall bias and social desirability bias, which could lead to inaccuracies in reporting actual behaviors and subsequently, in assessing their association with spinal degeneration.

Lack of Longitudinal Data: The absence of longitudinal data limits the ability to track the progression of spinal degenerative changes over time. Understanding how spinal degeneration evolves would provide more comprehensive insights into the effectiveness of preventive measures and treatments.

Confounding Variables: While the study controlled for several known risk factors, there may be unmeasured confounding variables that could influence the results. For example, genetic predispositions, occupational hazards and other environmental factors not accounted for in the study could play significant roles in the development and progression of spinal degeneration.

Imaging Techniques: The study reliance on MRI for diagnosing spinal degeneration is both a strength and a limitation. While MRI is a highly sensitive tool for detecting spinal changes, differences in imaging protocols, interpretations and the subjective nature of assessing degeneration severity can introduce variability in the results.

Exclusion Criteria: The exclusion of individuals with a history of spinal surgery or trauma could also limit the understanding of spinal degeneration's full scope. These conditions could provide valuable insights into the compensatory mechanisms and recovery patterns associated with spinal health.

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