

Prevalence of Cervical and Lumbar Stenosis and it's Associated Risk Factors at Peshawar Medical Imaging Center, Peshawar

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ABSTRACT

Spinal stenosis is one of the most persistent diseases categorized by the abnormal narrowing of the spinal canal that results in pressure on the spinal cord or nerve roots. The narrowing of the spinal canal is due to degenerative changes in spinal joints, intervertebral discs, disc herniation, and thickening of ligaments surrounding the spinal canal. Magnetic Resonance Imaging being high resolution images, ability to visualize soft tissues, multi- planar imaging capabilities, non-invasive nature and lack of radiation play a crucial role in identifying Spinal stenosis. A cross-sectional,

single center study was conducted involving 330 MRI-scanned patients. Spinal stenosis diagnosis was based on standard radiological criteria. Data on demographics, medical history and physical activity were collected and analyzed for statistical significance. The prevalence of cervical was 17.5% (n=165) with lumbar region more predominant shown 47.8% (n=165), of participants were diagnosed with stenosis. Moderate stenosis was the most prevalent severity (14.8%), followed by mild (11.5%) and severe (6.4%) cases. Males (50.6%) were slightly more affected than females (49.4%). A large majority of participants (100.0%) reported back pain, most commonly of sub-acute duration (50.6%). Chi-square analysis showed significant associations of spinal stenosis with sedentary lifestyle ($p = 0.021$), physical activity ($p = 0.012$), and diabetes ($p = 0.014$), while no significant association was found with BMI ($p = 0.590$). These results suggest that lumbar spinal stenosis of moderate severity is the most common presentation, with sedentary lifestyle, engaging regular physical inactivity, and diabetes being major contributory risk factors.

Keywords: MRI, spinal stenosis, BMI, multi- planar imaging and lumbar

INTRODUCTION

Spinal stenosis is an abnormal narrowing of the spinal canal that results in pressure on the spinal cord or nerve roots. The narrowing of the spinal canal is due to degenerative changes in spinal joints, intervertebral discs, disc herniation, and thickening of ligaments surrounding the spinal canal (Deer *et al.*, 2019; Ravindra *et al.*, 2022). The upper neck (cervical) and lower back (lumbar) areas are most frequently affected, although the thoracic spine also can be compressed most frequently by a disk herniation. Three different anatomic sites within the vertebral canal can be affected by spinal stenosis. First, the central canal, which houses the spinal cord, can be narrowed in an anterior- posterior dimension, leading to compression of neural elements and reduction of blood supply to the spinal cord in the cervical area and the cauda equina in the lumbar area. Secondly, the neural foramen, which are openings through which the nerve roots exit the spinal cord, can be compressed as a result of disk herniation, hypertrophy of the facet joints and ligaments, or unstable slippage of one vertebral body relative to the level below. Lastly, the lateral recess, which is seen in the lumbar spine only and is defined as the area along the pedicle that a nerve root enters just before its exit through the neural foramen, can be compressed from a facet joint hypertrophy (Tang *et al.*, 2019; Glassman *et al.*, 2019; Bindal *et al.*, 2019).

Symptoms of spinal stenosis develop gradually and are related to the level and severity of nerve compressions in cervical spinal stenosis, symptoms include neck pain, stiffness, numbness, tingling, or weakness in the arms, hands, legs, and feet. Problems with balance and walking difficulties are common due to spinal cord compression. Patients may also experience coordination difficulties, balance problems, and in severe cases, loss of bladder or bowel control. Symptoms typically develop gradually over time. The dynamic narrowing of the cervical canal during neck extension often exacerbates symptoms (Moley *et al.*, 2025; Ravindra *et al.*, 2022; Deer *et al.*, 2019). Thoracic spinal stenosis is rarer but leads to mid-back pain and neurological symptoms below the affected spinal level, such as numbness, weakness, or gait disturbances (Tokuhashi *et al.*, 2025).

In lumbar spinal stenosis, patients often experience lower back pain, sensory disturbances, motor weakness, pain or cramping in one or both legs, especially standing for long periods or walking, which tends to improve when bending forward or sitting. Neurogenic claudication, characterized by leg pain radiating to the buttocks, thighs, and calves due to nerve compression, is a trait mark symptom, often worsened by lumbar extension and relieved by flexion (Lurie et al., 2025).

There are three main types of spinal stenosis depending on the anatomical location affected: cervical, thoracic, and lumbar stenosis, with lumbar stenosis being the most common form of spinal stenosis. The disorder can also be classified as primary, due to congenital spinal canal narrowing, or secondary from acquired degenerative changes including spondylolisthesis and trauma. (Kim *et al.*, 2020; Ravindra *et al.*, 2022). Cervical spinal stenosis occurs in the upper region of the spine or neck. The main cause of cervical spinal stenosis is degenerative changes brought on by aging, such as spondylosis, which involves disc degeneration, side joint enlargement, and ligament thickening. These modifications cause the cervical spinal canal to narrow and the spinal cord and nerve roots to compress. Additional causes include ossification of the posterior longitudinal ligament, inflammatory diseases such rheumatoid arthritis, trauma, and congenital spinal canal constriction. Because cervical stenosis is a dynamic condition, symptoms and canal narrowing may worsen with movements like neck extension. If left untreated, this condition might result in serious neurological deficits and calls for cautious diagnostic and therapeutic measures (Fehlings et al., 2020).

Narrowing of the spinal canal in the mid-back region is a characteristic of a relatively uncommon disorder called thoracic spinal stenosis, which can cause neurological impairments and spinal cord compression. Degenerative alterations like ligament thickening or facet joint arthrosis are typically the cause of this uncommon disorder. Spinal abnormalities like scoliosis may make these degenerative processes worse and result in segmental instability, particularly in the lower thoracic spine (Tokuhashi et al., 2025).

Materials and Methods

3.1 Study Design, Setting, and Duration

This research was conducted as a prospective cross-sectional study to evaluate clinical and radiological factors among patients in Peshawar. The primary research sites included the Peshawar Medical Imaging (PMI) center and the Sarhad University of Science and Information Technology. Data collection was carried out over a six-month period, spanning from March 2025 to August 2025, to ensure a comprehensive capture of clinical presentations.

3.2 Population and Sample Size

The study population consisted of patients visiting the PMI center for diagnostic imaging. A total of 330 clinical samples were collected, satisfying the requirements determined by the Cochran Formula. The sample size was calculated based on a previously reported prevalence of 31.1% (Ahmed et al., 2020), utilizing a 95% confidence level ($Z = 1.96$) and a 5% margin of error ($e = 0.05$). The resulting calculation indicated a minimum requirement of 329 participants, which was met by the final sample size of 330.

3.3 Sampling Technique and Selection

CriteriaA non-probability convenient sampling method was employed to recruit participants who met specific clinical criteria. Inclusion was restricted to adults aged 18 to 70 years presenting with neck or lower back pain, specifically those experiencing paresthesia (pins and needles sensation) in the extremities and undergoing a complete MRI scan. To maintain the integrity of the radiological data, the study excluded pregnant females, pediatric patients under 18 years of age, and individuals with a history of spinal surgery. Additionally, patients with claustrophobia or those unable to provide a coherent medical history were excluded from the final cohort.

3.4 Data Collection and Ethical Considerations

Ethical clearance for this study was granted by the Ethical Research Committee of the Sarhad Institute of Allied Health Sciences. Data were gathered through a structured, self-administered questionnaire that integrated demographic information, radiological factors, and clinical symptoms. Prior to data collection, formal permission was obtained from the Head of the Department at Peshawar Medical Imaging Center. Participation was entirely voluntary; informed consent was obtained from each individual, and the process was conducted with the utmost respect for patient privacy and without disrupting clinical operations.

3.5 Statistical Analysis

The collected data were processed and analyzed using IBM SPSS Version 24. Descriptive statistics, including frequencies, percentages, and graphical representations, were used to summarize the demographic and clinical profiles of the participants. Furthermore, inferential statistics, specifically logistic regression and correlation analyses, were performed to identify significant relationships between the studied variables.

RESULTS

In present study, total 330 patients were examined for findings of Spinal stenosis. Among total population 167 were male showing a frequency of (50.6%) and 163 were female, showing a frequency of (49.6%). This indicates a slightly higher prevalence of spinal stenosis among the male population as compared to females as shown in table no 4.1.**Table 4.1** Gender-Based Distribution of Study Participants

Gender	Frequency	Percent
Female	163	49.4
Male	167	50.6
Total	330	100.0

Distribution of Study Participants with Neck Pain and Back Pain

The participants of the current study were also identified for having neck pain and back pain. All of the participants answered “Yes” which meant that they had back pain. Among the total population 330 (100%) participants answered “Yes”. It indicates that majority of study population experienced neck pain and back pain as shown in table 4.2.**Table 4.2** Distribution of Study Participants with Neck Pain and Back Pain

Neck Pain	Frequency	Percent
No	0	0.00
Yes	165	50.0

Lower Back Pain

No	0	0.00
Yes	165	50.0
Total	330	100.0

Duration-Based Distribution with Neck Pain and Back Pain of Study Participants

The current study participants were divided into acute, sub-acute and chronic durations of Neck Pain and back pain. The result of the study demonstrated that majority of patients had sub-acute pain (50.6%), participants with acute pain were less prevalent (42.7%) while a small group of people had chronic duration of pain (6.7%) as shown in table 4.3. This indicated that majority participants had sub-acute duration of back pain. **Table 4.3** Duration-Based Distribution with Neck Pain Back Pain of Study Participants

Duration of Back pain	Frequency	Percent
Sub-acute	167	50.6
Acute	141	42.7
Chronic	22	6.7
Total	330	100.0

Regional-Based Distribution of cervical and lumbar Spinal Stenosis

The study population with cervical and lumbar Spinal Stenosis demonstrated that Lumbar Spinal Stenosis had a greater frequency of (47.8%) as compared to cervical stenosis (17.5%) as shown in table 4.4. This indicated that lumbar region of spine was mostly affected in the study population.

Table 4.4: Regional-Based Distribution of cervical and lumbar Spinal Stenosis

Types of spinalresence stenosis	Absence	orFrequency	Percent
Lumber	Yes	79	47.8
	No	86	52.2
	Total	165	100.0
Cervical	Yes	29	17.5
	No	136	82.5
	Total	165	100.0
Total		330	

Distribution of Spinal Stenosis based on Severity

Based on severity the spinal stenosis is classified into three types. The study population was radiographically graded using a 3-level scale i-e mild, moderate and severe form of spinal stenosis. The majority of participants demonstrated moderate stenosis (14.8%), some had mild (11.5%) while few (6.4%) were diagnosed with severe stenosis as shown in table 4.6. It indicated that based on severity moderate spinal stenosis is the most prevalent form of spinal stenosis among the study population.

Table 4.5: Distribution of Spinal Stenosis based on Severity.

Severity	Frequency	Percent
Non stenosis	222	67.3

Mild	38	11.5
Moderate	49	14.8
Severe	21	6.4
Total	330	100.0

Correlation of specific risk factors with cervical and lumbar spinal stenosis:

To analyze association between two categorical variables i.e. dependent (spinal stenosis) and independent variable (BMI, sedentary lifestyle, Diabetes, physical activity) we applied Chi-square test. The participants included in our study showed no significant association between BMI and spinal stenosis ($\chi^2 = 143.452$, $p = 0.590$), with obesity being the most common category (36.96%). A significant association was found between sedentary lifestyle and spinal stenosis ($\chi^2 = 0.023$, $p = 0.021$), A significant association was found between regular physical activity and spinal stenosis ($\chi^2 = 0.018$, $p = 0.012$), A statistically significant association was found ($\chi^2 = 0.018$, $p = 0.014$), with diabetics 73.9% of participants having cervical and lumbar spinal stenosis as shown in table 4.7.

Table 4.7 Correlation of specific risk factors with cervical and lumbar spinal stenosis

Variables			Frequency SS of N= 330	theX2(Chi- square value)	P(Probability value)
1.	BMI of participants	theUnderweight	46 (13.93%)	143.452	0.590
		Normal	42 (12.72%)		
		Overweight	120 (36.36%)		
		Obese	122 (36.96%)		
2.	Sedentary life style	No	34 (10.3%)	0.023	0.021
		Yes	296(89.7%)		
3.	ge in Physical	No	153 (46.4%)	0.018	0.012
	activity	Yes	177 (53.6%)		
4.	Diabetes	No	86 (26.1%)	0.018	0.014
		Yes	244 (73.9%)		

DISCUSSIONS

In our study conducted at Peshawar Medical Imaging, a total of 330 patients were assessed to determine the prevalence of spinal stenosis and its associated risk factors. The findings revealed that 32.7% of participants were diagnosed with cervical and lumbar spinal stenosis, with the lumbar region being the most commonly affected (23.9%), followed by cervical (8.8%) involvement. Moderate stenosis was the most prevalent severity (14.8%), followed by mild (11.5%) and severe (6.4%) cases. Males (50.6%) were slightly more affected than females (49.4%). A large majority of participants (100.0%) reported neck pain and back pain, most commonly of sub-acute duration (50.6%). Chi-square analysis showed significant associations of spinal stenosis with previous injury or trauma ($p = 0.021$), physical activity ($p = 0.012$), and diabetes ($p = 0.014$), while no significant association was found with BMI ($p = 0.590$). These results suggest that lumbar spinal stenosis of moderate severity is the most common presentation, with life style, physical inactivity, and diabetes being major contributory risk factors.

In our study, BMI was not found to be significantly associated with Spinal Stenosis ($\chi^2 = 143.452$, $p = 0.590$) among 330 participants with obesity being the most common category. In contrast, Lee *et al.* (2022) used nationwide Korean cohort data to demonstrate a relationship between higher body mass index (BMI) as a long-term risk of spinal stenosis. Our study shows a similarity in obesity being a common risk factor while difference may be due to smaller sample size and uneven BMI distribution in our study compared to a larger imaging-based population. In our study, a sedentary lifestyle was significantly associated with spinal stenosis ($\chi^2 = 0.023$, $p = 0.021$), with 89.7% of participants reporting injury. Similarly, Lin *et al.* (2023) utilized biomechanical modeling and confirmed that greater degrees of spinal canal narrowing were associated with increased stress and strain on the spinal cord during impact, potentially leading to more severe neurological outcomes. Both the studies confirmed sedentary lifestyle as a contributing factor in spinal stenosis.

In our study, regular physical activity was significantly associated with spinal stenosis ($\chi^2 = 0.018$, $p = 0.012$), with lifestyle being the most common among the 330 participants. In order with this study, De Vivo *et al.* (2018) objectively measured daily activity levels and reported that individuals with symptomatic spinal stenosis took fewer daily steps and were engaged in longer sedentary periods compared to healthy controls. Both the studies confirmed regular physical as a contributing factor to spinal stenosis.

In our study, diabetes mellitus was also significantly associated with spinal stenosis ($\chi^2 = 0.018$, $p = 0.018$), with 73.9% of the 330 participants being diabetic. Similarly, Wang *et al.* (2020) conducted a study which concluded that the diabetes was significantly associated with an increased risk of developing spinal stenosis, particularly in patients with longer duration. Both the studies confirmed diabetes mellitus as an important risk factor for spinal stenosis..

CONCLUSION

This study concludes that cervical and lumbar spinal stenosis was a prevalent condition among patients undergoing MRI at Peshawar Medical Imaging, Peshawar. The lumbar (47.8%) region was more predominant compared with cervical (17.5%) region of the spine and moderate severity, the most frequent presentation. The condition was significantly associated with obesity, diabetes, physical activity, and sedentary lifestyle. Contrary to most existing research, BMI did not show a statistically significant association, warranting further exploration. These findings highlight the need for early detection, preventive strategies, and lifestyle modifications to manage the rising burden of spinal stenosis.

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