Volume 3, Issue 7, 2025

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

# FREQUENCY OF LUMBAR FLEXIBILITY AND IT'S ASSOCIATION WITH LOW BACK PAIN, A CROSS-SECTIONAL STUDY AMONG PUBLIC SECTOR INSTITUTIONS

**Deena Bai[*1], Barkha devi[2], Preeti[3], Anmol Muskan[4], Poonam Mahraj[5]**
**Aimen Rafiq[6], Kamlesh Kumar[7], Neelam Mahraj[8]**

*[*1]Physiotherapist, Zubaida Medical Center, Karachi, Pakistan*
*[2,3,4]House Officer, Sindh Institute of Physical Medicine and Rehabilitation (SIPMR), Karachi, Pakistan*
*[5]House Officer, Jinnah Postgraduate Medical Centre (JPMC), Karachi, Pakistan*
*[6]Physician, National Institute of Cardiovascular Diseases (NICVD), Karachi, Pakistan*
*[7]Graduate, Sindh Madressatul Islam University, Karachi, Pakistan*

**DOI:** https://doi.org/10.5281/zenodo.17091215

**Keywords**
*Flexibility, backache, lumbar spine, adolescence, sedentary lifestyle.*

**Article History**
*Received: 11 June 2025*
*Accepted: 21 August 2025*
*Published: 04September 2025*



**Corresponding Author: ***
**Deena Bai**

## Abstract

***Background:***
*Spinal flexibility is all about how much your spine can move in different directions. The spine is made up of small bones called vertebrae that connect from top to bottom, forming the vertebral column. The flexibility of the spine allows for movements like bending forward, backward, and sideways. Measuring spinal flexibility is a key part of examining patients with back pain. The lower back, or lumbar spine, is especially important for maintaining flexibility. It is made up of five vertebrae and plays a major role in supporting and allowing movement in the upper body. This research focused on the frequency of low back discomfort among students attending public sector institutions.*

***Methods:***
*A cross-sectional study was conducted among students of DIPMR, SIPMR, and DMC. Lumbar flexibility and its association with low back pain were evaluated. Information was gathered using a self-generated questionnaire, and data were analyzed using SPSS 21. The study was conducted over three months after synopsis approval.*

***Results:***
*A total of 309 participants were included, with 98 (31.7%) males and 211 (68.3%) females aged 18–25 years. Analysis, including Chi-Square tests, revealed a positive association between lumbar flexibility and low back pain ($p < 0.001$). Participants with low back pain had average flexibility (52.5%), while those without pain had good flexibility (73.9%). Low back pain was more common in females than males.*

***Conclusion:***
*This study found an association between lumbar flexibility and low back pain. Early detection could help prevent future disabilities. Many students are unaware of how physical activity affects flexibility. Preventive measures, like staying active,*

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

*can improve quality of life and reduce the risk of low back pain.*

## INTRODUCTION

The capacity of the spine to move in various directions is referred to as Spinal flexibility. Spinal flexibility refers to the range of motion and suppleness of the spine. It is influenced by factors such as joint mobility, muscle flexibility, and the elasticity of connective tissues. The spine is composed of many small bones called vertebrae that are joined from top to bottom to form vertebral column. It plays a vital role in supporting the surrounding structures and also protects the spinal cord. The flexibility of the spine enables a variety of motions, including flexion, extension, and lateral rotation. Spinal flexibility measurements are a key component of the examination of patients with any type of back pain. The lumbar spine is an important parameter to maintain the flexibility of lower back. The area of the spine between the thoracic (upper back) and sacral (bottom of the spine) spines is known as the lumbar spine, or lower back. It is made up of five vertebrae, numbered L1 through L5, and is essential for supporting and allowing flexibility to the upper body. Its ability to bend sideways, backward, and forward is referred to as its flexibility. The intervertebral discs, which serve as cushions between the vertebrae, and the surrounding muscles and ligaments are two factors that affect the flexibility of the lumbar spine because ligamentous and capsular stiffness of the joints may be associated with low back pain [20]. For the spine to function properly and to avoid injuries, flexibility and stability must be maintained in balance.

Abnormality in spine results in low back discomfort, which is a very prevalent disease affecting millions of individuals worldwide. It refers to discomfort or pain in the lumbosacral region. Lumbar spine flexibility has an impact on low back pain because low back pain is related to lumbar range of motion [3]. A study done in Tunisia (North Africa) in 2015 evaluated low back pain and compared performance in many sports, including gymnastics, judo, volleyball, basketball, and athletics, with body mass index and smoking patterns. Out of the 5,958 participants, 879 (14.8%) reported having LBP. Females (17.6%) had a significantly greater frequency of LBP than males (12.5%). Body mass index and smoking behavior had no effect on LBP prevalence. Gymnastics, judo, handball, and volleyball were the sports with the highest rates of LBP, followed by basketball and athletics [5].

Another study done in Finland at Turku University on 98 participants, including 33 non-athletes, 34 boy athletes (ice hockey and soccer players), and 31 girl athletes (figure skaters and gymnasts), evaluated lumbar mobility and prevalence of low back pain in adolescence. They concluded that 29 athletes and 6 non-athletes reported having low back pain for more than a week. Boys' baseline lumbar spine flexibility measures between athletes and non-athletes showed no statistically significant differences, while girls who were not athletes had considerably greater lumbar ROM and lower segment ROM [12]. To assess flexibility and ROM of the lumbar spine, Modified-Modified Schober Test (MMST) has been used because part of the fluctuations in lumbar mobility could be attributed to the diverse methods utilized for measurement [3]. It is a clinical measurement used to assess lumbar spine flexibility. It involves measuring the distance between two marked points on the lower back during forward flexion. It is the most dependable and simple method because of its close resemblance to radiographic evaluation of lumbar spine movements, particularly flexion [4].

According to American Physical Therapy Association (APTA), MMST is the most reliable method to assess spinal mobility on patients with chronic low back pain. The reliability for flexion is 0.72 cm while for extension is 0.76 cm [6]. Lumbar spine mobility is shown by the difference between the measurement in the flexed and extended positions [6]. MMST is used because of its reasonable consistency, moderate validity, straightforward technique, low training

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ISSN: (e) 3007-1607 (p) 3007-1593

requirements, and usage as a guiding scale for flexibility measurement. Physical therapy is an evidence-based health care profession which provides definite care to patients and helps to improve their pain and mobility.

## 2.METHODOLOGY

Data collection began once the summary was accepted. A cross-sectional survey of students at public sector institutions was conducted three months after acceptance. Data entry and analysis were performed using SPSS 21, reporting frequency, mean, median, and mode. Lumbar flexibility and its association with low back pain were examined.

Participants included male and female students aged 18 to 25 years. Excluded were those with lower extremity pathology, neurological or musculoskeletal problems, trauma, mechanical back pain, or hip, knee, or back surgery within the past six months, as well as postgraduate students. Independent variables included flexibility, age, medical year, and gender, while dependent variables were weight and low back pain.

A cross-sectional survey-based design with non-probability sampling was employed. Data were collected using a self-created questionnaire from students at Sindh Institute of Physical Medicine and Rehabilitation (SIPMR), Dow Medical College (DMC), and Dow Institute of Physical Medicine and Rehabilitation (DIPMR). Consent for voluntary participation was obtained through coordinators or class representatives via notices or announcements. Using a frequency of 72.1% and OpenEpi version 3, the sample size was determined as 309, with a 5% margin of error and a 95% confidence level [21].

Flexibility was evaluated using the Modified-Modified Schober Test. Results below 15 cm were classified as Very Poor Flexibility, 15–17 cm as Poor, 18–20 cm as Average, 21 cm as Good, and above 21 cm as Excellent Flexibility.

**SELF-ADMINISTERED QUESTIONNAIRE:**

A 10-question self-administered questionnaire, adapted from various studies, will evaluate lumbar flexibility frequency and its association with low back pain in a cross-sectional study among public sector institutions.

**2.1. Data Analysis Procedure:**

Data analyzed using SPSS; variables reported as frequencies and percentages, with frequency distribution and cross-tabulation. Results presented in tables, pie charts, and bar charts.

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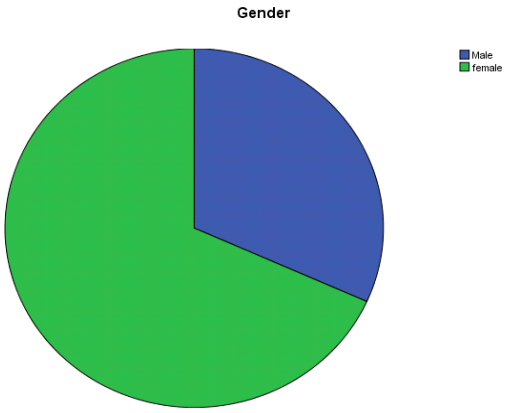
## 3.Results:

A total of 309 participants met the inclusion criteria, including 98 (31.7%) men and 211 (68.3%) women. Among them, 177 (57.3%) were negative for LBP, while 132 (42.7%) were positive. Women were more prevalent in the sample. A positive association between lumbar flexibility and LBP was observed ($p < 0.001$) using the Modified-Modified Schober Test.

**Demographic characteristics of Participants.**



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Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

**Fig 1.1: Gender of Participants: Out of 309 Participants, 211 (68.3%) were female and 98 (31.7%) were males.**

**Fig: 1.3: Bar Chart.**

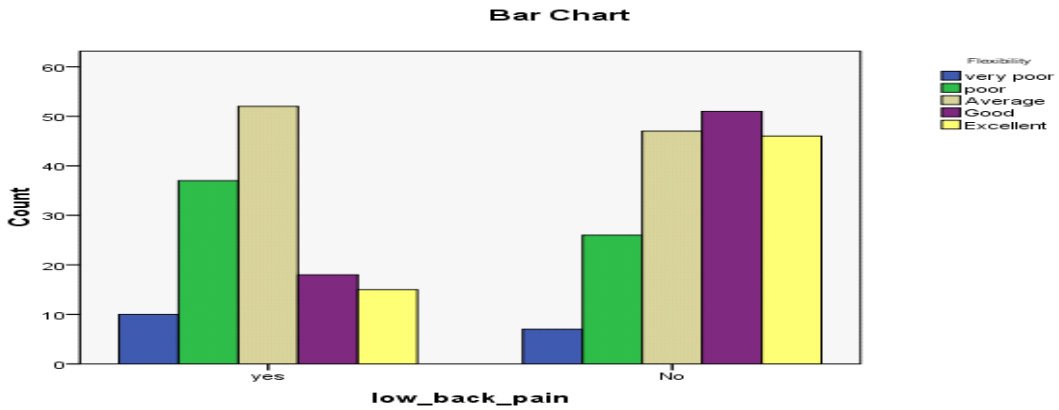


**Fig 1.3: Bar Chart**

The bar chart shows the association between low back pain and lumbar flexibility. "Average flexibility" is higher among those with pain, while "Good flexibility" is more common in those without pain. Other flexibility levels show varied distribution, indicating differences between individuals with and without low back pain.

**Table 1.1: Age of Participants**

| Age in years | | | | | |
|---|---|---|---|---|---|
| | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | 18 | 3 | 1.0 | 1.0 | 1.0 |
| | 19 | 20 | 6.5 | 6.5 | 7.4 |
| | 20 | 33 | 10.7 | 10.7 | 18.1 |
| | 21 | 44 | 14.2 | 14.2 | 32.4 |
| | 22 | 43 | 13.9 | 13.9 | 46.3 |
| | 23 | 76 | 24.6 | 24.6 | 70.9 |
| | 24 | 46 | 14.9 | 14.9 | 85.8 |
| | 25 | 44 | 14.2 | 14.2 | 100.0 |
| | Total | 309 | 100.0 | 100.0 | |

**Table 1.1: Age of Participants: There was total 309 participant and their age range from 18 years to 25 years.**

**Table 1.2: Weight Of participants**

**Weight**

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|

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| | | | | | |
|---|---|---|---|---|---|
| Valid | 1 | 51 | 16.5 | 16.5 | 16.5 |
| | 2 | 130 | 42.1 | 42.1 | 58.6 |
| | 3 | 84 | 27.2 | 27.2 | 85.8 |
| | 4 | 33 | 10.7 | 10.7 | 96.4 |
| | 5 | 8 | 2.6 | 2.6 | 99.0 |
| | 6 | 3 | 1.0 | 1.0 | 100.0 |
| | Total | 309 | 100.0 | 100.0 | |

**Table 1.2: Out of 309 participants, 51 were aged 35–45, 130 were 46–55, 84 were 56–65, 33 were 66–75, 8 were 76–85, and 3 were 86–95.**

**Table 1.3: Flexibility score of Participants.**

**Flexibility**

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | very poor | 17 | 5.5 | 5.5 | 5.5 |
| | poor | 63 | 20.4 | 20.4 | 25.9 |
| | Average | 99 | 32.0 | 32.0 | 57.9 |
| | Good | 69 | 22.3 | 22.3 | 80.3 |
| | Excellent | 61 | 19.7 | 19.7 | 100.0 |
| | Total | 309 | 100.0 | 100.0 | |

**Table 1.3: flexibility score of participants**

**Case Processing Summary**

| | Cases | | | | | |
|---|---|---|---|---|---|---|
| | Valid | | Missing | | Total | |
| | N | Percent | N | Percent | N | Percent |
| low_back_pain * Flexibility | 309 | 100.0% | 0 | .0% | 309 | 100.0% |

**Table 2.1: Case processing summary**

**Table 2.2: Low back pain and Flexibility Cross tabulations: shows Association of Lumber Flexibility with Low Back Pain.**

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ISSN: (e) 3007-1607 (p) 3007-1593

**low_back_pain * Flexibility Crosstabulation**

| | | | Flexibility | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | very poor | poor | Average | Good | Excellent | Total |
| low_back_pain | yes | Count | 10 | 37 | 52 | 18 | 15 | 132 |
| | | % within low_back_pain | 7.6% | 28.0% | 39.4% | 13.6% | 11.4% | 100.0% |
| | | % within Flexibility | 58.8% | 58.7% | 52.5% | 26.1% | 24.6% | 42.7% |
| | No | Count | 7 | 26 | 47 | 51 | 46 | 177 |
| | | % within low_back_pain | 4.0% | 14.7% | 26.6% | 28.8% | 26.0% | 100.0% |
| | | % within Flexibility | 41.2% | 41.3% | 47.5% | 73.9% | 75.4% | 57.3% |
| Total | | Count | 17 | 63 | 99 | 69 | 61 | 309 |
| | | % within low_back_pain | 5.5% | 20.4% | 32.0% | 22.3% | 19.7% | 100.0% |
| | | % within Flexibility | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |

**Table 2.3 Chi Square Test**

**Chi-Square Tests**

| | Value | df | Asymp. Sig. (2-sided) | Exact Sig. (2-sided) | Exact Sig. (1-sided) | Point Probability |
|---|---|---|---|---|---|---|
| Pearson Chi-Square | 28.286[a] | 4 | .000 | .000 | | |
| Likelihood Ratio | 29.100 | 4 | .000 | .000 | | |
| Fisher's Exact Test | 28.648 | | | .000 | | |
| Linear-by-Linear Association | 23.694[b] | 1 | .000 | .000 | .000 | .000 |
| N of Valid Cases | 309 | | | | | |

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.26.

b. The standardized statistic is 4.868.

**Table 2.3: Chi-Square Test:**

Chi-Square analysis showed a significant association between lumbar flexibility and low back pain: Pearson $\chi^2 = 28.286$ ($df = 4$, $p < 0.001$), likelihood ratio = 29.100 ($df = 4$, $p < 0.001$), linear-by-linear = 23.694 ($df = 1$, $p < 0.001$), and Fisher's Exact Test = 28.648 ($p < 0.001$), indicating a strong relationship.

**DISCUSSION:**

There is limited information regarding the correlation between lumbar flexibility and low back pain (LBP). Our study found that candidates with LBP had average flexibility, while those without LBP had good flexibility. Final-year medical students were more prone to LBP. These findings are similar to Amelot A. (2019), who conducted a prospective study among 1,800

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ISSN: (e) 3007-1607 (p) 3007-1593

medical students (2nd–6th year) using a self-administered modified Standardized Nordic Questionnaire; 835 (72.1%) reported LBP due to high stress levels and long study hours.

A 2016 Nigerian study among 207 undergraduate clinical physiotherapy students found LBP to be the most prevalent work-related musculoskeletal condition and a major cause of disability. Lifetime, 12-month, 1-month, and 7-day prevalence of LBP were 45.5%, 32.5%, 17.7%,

and 11.5%, respectively. Javed A. (2023) assessed disability linked to LBP among 121 DPT students at WIRS Abbottabad using NPRS and Oswestry Disability Scale; 61.0% reported mild LBP, 35.5% moderate, and 2.5% severe pain, while Oswestry scores showed 43% mild disability, 6.6% moderate, and 0.8% severe disability interfering with daily activities.

An Indian study establishing normal values for the Modified-Modified Schober Test (MMST) among 200 healthy adults (aged 21–40) found lumbar extension decreases with age; males showed higher lumbar flexion than females, with MMST extension 2.42±0.74 cm and flexion 6.85±1.18 cm. A Japanese study also confirmed a link between chronic LBP and walking disabilities.

In our study, 132 (42.7%) students were positive for LBP and 177 (57.3%) negative. Overall LBP prevalence among physical therapy students using MMST was 42.7%. Candidates without LBP mostly had good flexibility (73.9%), while those with LBP had average flexibility (52.5%). Other studies suggest Modified Schober, sit-and-reach, and lateral bending tests do not predict future back pain but correlate with past or present LBP. Hamstring flexibility showed no correlation with lumbar flexion or LBP, indicating that preventing or treating LBP may not require increased hamstring flexibility.

Frequent LBP is linked with early degenerative changes in lower lumbar discs, reduced spinal function, and decreased physical activity in youth. In industrial workers, lumbar sagittal range of motion may differentiate those with LBP, though sit-and-reach tests did not. Recognizing and managing LBP risk factors can improve medical students' welfare and productivity. Exercises such as daily 30-minute walking reduce LBP and associated analgesic use, improving academic performance and sleep quality. A Pakistani study on chronic non-specific LBP patients found retro walking combined with conventional treatment significantly improved pain, flexibility, and physical function compared to conventional treatment alone.

## CONCLUSION:

The study found that candidates, with or without low back pain, had average to good flexibility. Among those with low back pain, 52.5% had average lumbar flexibility, suggesting low flexibility may contribute to LBP. Early detection could help prevent future disabilities. Many candidates were unaware of their physical activity levels, and LBP was more common in females. Reducing risk factors and promoting exercise may improve students' quality of life and help prevent low back pain.

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