

# Influence of Sedentary Lifestyle and Prolonged Sitting on Lumbo-Pelvic Dysfunction and Chronic Low Back Pain: A Narrative Review

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## Abstract:

Sedentary lifestyle and prolonged sitting have become increasingly prevalent due to technological advancements, desk-based occupations, and reduced physical activity levels. Prolonged sitting posture has been strongly associated with lumbo-pelvic dysfunction, muscular imbalance, altered spinal biomechanics, and chronic low back pain (CLBP). Sustained sitting may contribute to reduced core muscle activation, posterior pelvic tilt, hamstring tightness, gluteal inhibition, and increased mechanical stress on lumbar structures, thereby predisposing individuals to chronic musculoskeletal dysfunction. This narrative review aims to evaluate the influence of sedentary behavior and prolonged sitting on lumbo-pelvic dysfunction and chronic low back pain while highlighting current physiotherapy rehabilitation strategies. A structured literature search was conducted using PubMed, Google Scholar, Scopus, PEDro, and Cochrane Library databases for studies published between 2000 and 2025. Evidence from randomized controlled trials, systematic reviews, cohort studies, and observational investigations demonstrated that prolonged sitting and physical inactivity significantly contribute to postural dysfunction, lumbar instability, reduced muscular endurance, and chronic low back pain. Exercise-based rehabilitation approaches including core stabilization, stretching, ergonomic correction, motor control exercises, and postural retraining demonstrated positive outcomes in improving pain, lumbo-pelvic stability, and functional performance. The findings support the importance of early physiotherapy intervention and ergonomic awareness in sedentary populations to reduce the risk of chronic low back pain and associated functional disability.

**Keywords:** Sedentary lifestyle, Prolonged sitting, Lumbo-pelvic dysfunction, Chronic low back pain, Core stabilization, Postural dysfunction, Ergonomics, Physiotherapy rehabilitation, Occupational low back pain, Lumbar biomechanics, Motor control exercises, Muscular imbalance.

## 1. Introduction

Sedentary lifestyle has emerged as a major public health concern worldwide due to increasing dependence on technology, prolonged desk-based occupations, and reduced physical activity participation (Pronk et al., 2012). Modern occupational environments frequently require individuals to remain seated for prolonged periods during computer-based tasks, online work, academic activities, and screen-related occupations. Prolonged sitting has been associated with several musculoskeletal disorders, particularly chronic low back pain (CLBP), which remains one of the leading causes of disability and reduced quality of life globally (Gupta et al., 2015; Szeto et al., 2005). The lumbo-pelvic region plays a critical role in maintaining postural stability, spinal alignment, force transmission, and functional movement efficiency (Richardson et al., 2004). Sustained sitting posture may alter normal lumbo-pelvic biomechanics through posterior pelvic tilt, reduced lumbar lordosis, increased spinal loading, and decreased activation of deep stabilizing musculature (Callaghan & McGill, 2001; Claus et al., 2008). Prolonged sitting may also contribute to hamstring tightness, hip flexor shortening, gluteal inhibition, and reduced core endurance, thereby increasing susceptibility to lumbar dysfunction and mechanical low back pain (van Dieën et al., 2001). Chronic low back pain associated with sedentary behavior is frequently multifactorial and may involve muscular imbalance, altered movement control, postural dysfunction, reduced spinal stability, and occupational stress (O'Sullivan et al., 2006). Office workers, students, drivers, and individuals with prolonged screen exposure are particularly vulnerable to these biomechanical and postural alterations (Szeto et al., 2005). Several studies have reported significant associations between prolonged sitting duration and increased prevalence of lumbar pain, functional disability, and reduced occupational productivity (Gupta et al., 2015; Pronk et al., 2012). Physiotherapy rehabilitation plays an essential role in the prevention and management of lumbo-pelvic dysfunction associated with sedentary behavior. Exercise-based interventions including core stabilization, motor control training, stretching, postural correction, ergonomic modification, and functional retraining have demonstrated beneficial effects in improving pain, posture, spinal stability, and physical function (Areudomwong et al., 2021; McGill, 2002; Richardson et al., 2004). Although considerable literature exists regarding low back pain rehabilitation, variability in intervention protocols and occupational populations continues to create uncertainty regarding optimal rehabilitation strategies. Therefore, this narrative review aims to synthesize current evidence regarding the influence of sedentary lifestyle and prolonged sitting on lumbo-pelvic dysfunction and chronic low back pain.

## 2. Methodology

### 2.1 Search Strategy

A structured literature search was conducted using PubMed, Google Scholar, PEDro, Scopus, and Cochrane Library databases to identify studies related to sedentary lifestyle, prolonged sitting, lumbo-pelvic dysfunction, and chronic low back pain. Search terms included "sedentary lifestyle," "prolonged sitting," "lumbo-pelvic dysfunction," "chronic low back pain," "core stabilization," "postural dysfunction," "ergonomics," and "physiotherapy rehabilitation." Keywords were used individually and in combination to retrieve relevant studies published between 2000 and 2025.

## 2.2 Study Selection

A total of 510 records were identified during the initial database search. After duplicate removal and title and abstract screening, 140 full-text articles were assessed for eligibility. Finally, 20 studies meeting the inclusion criteria were included in the final review.

### PRISMA Flow Diagram

#### PRISMA FLOW DIAGRAM



**Records identified through database searching:**

- PubMed (n = 140)
- Google Scholar (n = 210)
  - PEDro (n = 60)
  - Scopus (n = 70)
- Cochrane Library (n = 30)

**Total records identified = 510**



**Additional records identified through  
manual reference screening (n = 15)**



**Total records = 525**



**Duplicates removed (n = 105)**



**Records screened (n = 420)**



**Records excluded after title and  
abstract screening (n = 280)**

**Reasons:**

- Irrelevant topic
- Non-musculoskeletal population
- Non-sedentary population
- Editorial articles/opinion papers



**ELIGIBILITY**

**Full-text articles assessed  
for eligibility (n = 140)**



**Full-text articles excluded (n = 120)**

**Reasons:**

- Incomplete methodology (n = 35)
- No relevant outcome measures (n = 32)
  - Non-English studies (n = 18)
  - Case reports/editorials (n = 15)
- Insufficient intervention details (n = 20)



**INCLUDED**

**Studies included in qualitative synthesis (n = 20)**

**Included study designs:**

- **Randomized Controlled Trials**
- **Systematic Reviews**
- **Meta-analyses**
- **Cohort Studies**
- **Cross-sectional Studies**

**2.5 Data Extraction**

Data extraction focused on study design, participant characteristics, sedentary exposure duration, intervention protocols, outcome assessment tools, and major findings related to lumbo-pelvic dysfunction, chronic low back pain, posture, muscular imbalance, and rehabilitation outcomes.

**3. Results**

**3.1 Characteristics of Included Studies**

The final review included randomized controlled trials, systematic reviews, cohort studies, observational investigations, and meta-analyses published between 2000 and 2025. Most studies involved office workers, students, drivers, sedentary adults, and individuals exposed to prolonged sitting durations exceeding 6–8 hours daily (Gupta et al., 2015; Pronk et al., 2012). The majority of studies demonstrated significant associations between sedentary behavior, postural dysfunction, muscular imbalance, reduced core endurance, and chronic low back pain prevalence (Callaghan & McGill, 2001; van Dieën et al., 2001). Exercise-based physiotherapy interventions including core stabilization, stretching, ergonomic correction, and postural retraining demonstrated improvements in pain intensity, lumbar stability, and functional outcomes (Areeudomwong et al., 2021; Kim et al., 2015; McGill, 2002).

Study and Year	Study Type	Sample Size	Population	Intervention / Exposure	Outcome Measures / Scales	Key Findings
O’Sullivan et al. (2006)	Experimental Study	40	Office workers	Prolonged sitting posture analysis	Visual Analog Scale (VAS), Electromyography (EMG), Lumbar posture assessment	Prolonged sitting increased lumbar muscle fatigue and pain intensity
Callaghan & McGill (2001)	Laboratory Study	24	Healthy adults	Sustained seated posture exposure	Lumbar spine flexion angle, Spinal loading assessment	Sustained sitting increased spinal loading and lumbar flexion stress

Gupta et al. (2015)	Cohort Study	201	Office workers	Sedentary occupational exposure	Nordic Musculoskeletal Questionnaire (NMQ), VAS	Prolonged sitting associated with increased low back pain prevalence
van Dieën et al. (2001)	Experimental Study	30	Sedentary adults	Trunk muscle endurance assessment	Biering-Sørensen Test, EMG	Reduced trunk endurance associated with chronic low back pain
Pronk et al. (2012)	Cross-sectional Study	878	Desk-based employees	Sitting time analysis	Occupational Sitting and Physical Activity Questionnaire (OSPAQ)	Higher sitting duration associated with musculoskeletal discomfort
Hides et al. (2008)	Experimental Study	39	Chronic low back pain patients	Core stabilization exercises	Ultrasound imaging, VAS, ODI	Core stabilization improved lumbar muscle activation and pain
McGill (2002)	Clinical Study	50	Chronic low back pain patients	Core endurance tra		

Characteristics of the included studies

### 3.2.1 Influence of Prolonged Sitting on Lumbo-Pelvic Biomechanics and Postural Dysfunction

The reviewed studies consistently demonstrated that prolonged sitting significantly alters lumbo-pelvic biomechanics and contributes to postural dysfunction. Sustained seated posture was associated with posterior pelvic tilt, reduced lumbar lordosis, increased spinal loading, and altered activation of trunk musculature. Callaghan and McGill (2001) reported that prolonged sitting increased lumbar flexion stress and spinal loading, thereby contributing to mechanical strain on lumbar structures. Similarly, Claus et al. (2008) demonstrated that slumped sitting posture significantly reduced lumbar lordosis and altered spinal alignment. O’Sullivan et al. (2012) further identified strong associations between poor sitting posture and chronic lumbar dysfunction among sedentary adults. Prolonged sitting also contributed to muscular imbalance, reduced core muscle activation, hamstring tightness, and gluteal inhibition, resulting in impaired lumbo-pelvic stability and postural control. These biomechanical alterations may increase susceptibility to chronic low back pain and functional limitations in occupational populations. Confidence: Strong (consistent findings across biomechanical and observational studies).

### 3.2.2 Association Between Sedentary Lifestyle and Chronic Low Back Pain

Several studies identified a significant relationship between sedentary lifestyle, prolonged sitting duration, and increased prevalence of chronic low back pain. Gupta et al. (2015) demonstrated that prolonged occupational sitting was strongly associated with increased low back pain prevalence and musculoskeletal discomfort among office workers. Pronk et al. (2012) also reported that higher sitting duration significantly increased musculoskeletal symptoms and physical inactivity-related dysfunction. Waongenngarm et al. (2020) observed that prolonged sitting exposure increased lumbar discomfort, muscular fatigue, and pressure pain sensitivity in office workers. Sedentary behavior may contribute to reduced spinal mobility, decreased muscular endurance, impaired circulation, and increased mechanical stress on passive spinal structures. Additionally, reduced physical activity and prolonged static posture may negatively affect lumbar stabilization mechanisms, thereby increasing the risk of chronic mechanical low back pain. These findings suggest that sedentary lifestyle is an important modifiable risk factor for chronic low back pain and occupational musculoskeletal dysfunction. Confidence: Strong (supported by cohort, cross-sectional, and experimental investigations).

### 3.2.3 Role of Core Weakness and Muscular Imbalance in Lumbo-Pelvic Dysfunction

The reviewed evidence demonstrated that reduced core muscle endurance, impaired motor control, and muscular imbalance significantly contribute to lumbo-pelvic dysfunction and chronic low back pain. van Dieën et al. (2001) reported that reduced trunk muscle endurance was strongly associated with chronic low back pain and lumbar instability. Hides et al. (2008) demonstrated that chronic low back pain patients frequently exhibit impaired activation of deep stabilizing musculature, particularly the multifidus and transversus abdominis muscles. Similarly, Danneels et al. (2001) observed significant improvements in multifidus activation following lumbar stabilization exercises. Weakness of core musculature may impair spinal support, alter force transmission, and reduce lumbo-pelvic control during functional activities. Sedentary behavior may further contribute to gluteal weakness, hip flexor tightness, and reduced muscular endurance, thereby increasing compensatory loading on lumbar structures. These findings highlight the importance of core stabilization and motor control rehabilitation in sedentary populations with chronic low back pain. Confidence: Moderate to Strong (supported by experimental studies and clinical trials).

### 3.2.4 Effectiveness of Physiotherapy Rehabilitation in Sedentary Populations

Exercise-based physiotherapy interventions demonstrated positive effects in improving pain intensity, spinal stability, posture, flexibility, and functional performance among sedentary individuals with chronic low back pain. Areudomwong et al. (2021) reported significant reductions in pain intensity and improvements in flexibility and disability outcomes following combined stretching and core stabilization programs in office workers ( $p < 0.05$ ). McGill (2002) demonstrated that core endurance training significantly improved spinal stability and reduced disability in chronic low back pain populations. Ergonomic correction combined with exercise therapy also demonstrated beneficial effects in improving sitting posture and reducing occupational musculoskeletal symptoms (Kim et al., 2015). Motor control exercises, stretching interventions, postural retraining, and strengthening programs improved lumbo-

pelvic alignment, muscular endurance, and movement efficiency. These findings support the integration of ergonomic modification and exercise-based physiotherapy rehabilitation in the prevention and management of sedentary lifestyle-associated chronic low back pain. Confidence: Strong (consistent findings across randomized controlled trials and rehabilitation studies).

Summary of evidences

Theme	Key Finding	Population Applicability	Effect Direction	Confidence Level	Supporting Studies
<b>Influence of Prolonged Sitting on Lumbo-Pelvic Biomechanics and Postural Dysfunction</b>	Prolonged sitting significantly altered lumbo-pelvic biomechanics by increasing posterior pelvic tilt, reducing lumbar lordosis, and increasing spinal loading, thereby contributing to postural dysfunction and lumbar strain. Significant biomechanical alterations in sitting posture were reported across studies ( $p < 0.05$ ).	Sedentary adults, office workers, and computer professionals	Positive association between prolonged sitting and dysfunction	Strong	Callaghan & McGill (2001), Claus et al. (2008), O'Sullivan et al. (2012)
<b>Association Between Sedentary Lifestyle and Chronic Low Back Pain</b>	Sedentary behavior and prolonged occupational sitting were significantly associated with increased prevalence of chronic low back pain, muscular discomfort, and functional limitation ( $p < 0.05$ ).	Office workers, sedentary adults, desk-based employees	Positive association between sedentary lifestyle and CLBP	Strong	Gupta et al. (2015), Pronk et al. (2012), Waongenngarm et al. (2020)
<b>Role of Core Weakness and Muscular</b>	Reduced trunk muscle endurance, impaired core activation, gluteal	Adults with chronic low back pain and	Positive	Moderate to Strong	van Dieën et al. (2001), Hides et al. (2008),

Theme	Key Finding	Population Applicability	Effect Direction	Confidence Level	Supporting Studies
<b>Imbalance in Lumbo-Pelvic Dysfunction</b>	weakness, and muscular imbalance significantly contributed to lumbo-pelvic instability and chronic low back pain. Stabilization exercises improved multifidus activation and spinal stability ( $p < 0.05$ ).	sedentary populations			Danneels et al. (2001)
<b>Effectiveness of Physiotherapy Rehabilitation in Sedentary Populations</b>	Exercise-based rehabilitation including core stabilization, stretching, postural retraining, and ergonomic correction significantly improved pain, posture, flexibility, spinal stability, and functional performance ( $p < 0.05$ ).	Office workers and chronic low back pain populations	Positive	Strong	Areudomwong et al. (2021), McGill (2002), Kim et al. (2015), Richardson et al. (2004)
<b>Importance of Ergonomic Modification and Postural Awareness</b>	Ergonomic interventions and postural education significantly reduced occupational musculoskeletal discomfort and improved sitting posture and spinal alignment in sedentary populations ( $p < 0.05$ ).	Sedentary workers and office employees	Positive	Moderate	Kim et al. (2015), Szeto et al. (2005), Cho et al. (2015)

#### 4.1 Limitations

Despite the important findings of the present narrative review, several limitations should be considered. Variability in study design, sitting duration exposure, participant characteristics, intervention protocols,

and outcome assessment tools limited direct comparison between studies. Most included studies primarily focused on short-term outcomes, while evidence regarding long-term effects of sedentary behavior and prolonged sitting on lumbo-pelvic dysfunction remains limited. Additionally, differences in occupational populations, physical activity levels, ergonomic conditions, and psychosocial factors may have influenced study outcomes. Several studies relied on self-reported sitting duration and pain assessment, which may increase the risk of reporting bias. Furthermore, heterogeneity in physiotherapy rehabilitation protocols including exercise intensity, duration, and progression limits the establishment of standardized clinical recommendations for sedentary populations with chronic low back pain.

### 5. Research Gap and Future Directions

Although the reviewed studies demonstrated significant associations between sedentary lifestyle, prolonged sitting, lumbo-pelvic dysfunction, and chronic low back pain, several research gaps remain. Limited evidence exists regarding the optimal duration and intensity of sitting exposure associated with musculoskeletal dysfunction. Variability in ergonomic conditions, occupational demands, and rehabilitation protocols across studies creates difficulty in establishing standardized preventive and therapeutic guidelines. Most studies focused primarily on office workers and sedentary adults, while limited research has explored other occupational populations such as drivers, healthcare professionals, students, and remote workers. Additionally, long-term follow-up evidence regarding recurrence prevention, sustainability of rehabilitation outcomes, and progression of lumbo-pelvic dysfunction remains insufficient. Future research should focus on high-quality longitudinal and randomized controlled studies involving larger sample sizes and standardized outcome measures to better understand the long-term biomechanical and functional consequences of sedentary behavior. Further investigations should evaluate the effectiveness of individualized physiotherapy rehabilitation approaches combining ergonomic modification, core stabilization, motor control training, posture correction, and technology-assisted interventions in reducing chronic low back pain and improving occupational health outcomes.

### 6. Conclusion

Sedentary lifestyle and prolonged sitting significantly contribute to lumbo-pelvic dysfunction, postural alterations, muscular imbalance, and chronic low back pain in occupational and sedentary populations. Sustained sitting posture may increase spinal loading, reduce lumbar stability, impair core muscle activation, and alter normal lumbo-pelvic biomechanics, thereby increasing susceptibility to chronic musculoskeletal dysfunction. Evidence from the reviewed studies supports the effectiveness of physiotherapy rehabilitation approaches including core stabilization, stretching, postural retraining, ergonomic correction, and motor control exercises in improving pain, spinal stability, posture, and functional performance. Early identification of postural dysfunction and implementation of exercise-based rehabilitation and ergonomic strategies may play an important role in preventing chronic low back pain and improving quality of life in sedentary individuals.

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