



# Correlation Between Sitting Duration and Position and Lumbar Pain Among Office Workers

Yaşar Keskin<sup>1</sup>, Berna Ürkmez<sup>2</sup>, Fulden Öztürk<sup>3</sup>, Müge Kepekçi<sup>4</sup>, Teoman Aydın<sup>1</sup>

<sup>1</sup>Department of Physical Medicine and Rehabilitation, Bezmialem University, , Istanbul, Turkey

<sup>2</sup>Department of Physical Medicine and Rehabilitation, University of Health Sciences Turkey, Haydarpasa Numune Health Application and Research Center, Istanbul, Turkey

<sup>3</sup>Bezmialem University Faculty of Medicine, Istanbul, Turkey

<sup>4</sup>Department of Physical Medicine and Rehabilitation Health Science University, Kanuni Sultan Süleyman Research and Training Hospital, Istanbul, Turkey

## Abstract

**Introduction:** The aim of this study was to understand and evaluate whether long sitting durations and sitting position are risk factors for lumbar pain among office workers and to contribute to the existing literature on this subject.

**Methods:** A questionnaire comprising 18 items and 3 main sections about personal information, professional information, sitting position and duration, and lumbar pain was developed for office workers with lumbar pain. The questionnaire was distributed among 131 office workers aged between 18 and 65 years (mean age: 35±9.3 years; mean Body Mass Index (BMI): 25±3.83 kg/m<sup>2</sup>) who had complaints of lumbar pain.

**Results:** Among the office workers with long sitting durations, the percentages of standing and walking were lower and the severity of pain was higher. There was a correlation between the duration of pain and percentages of sitting, standing, and walking and between the severity of pain and percentage of sitting.

**Discussion and Conclusion:** A history of lumbar pain, high BMI, and long sitting duration at work may be the risks factors for lumbar pain among office workers.

**Keywords:** lumbar pain; office workers; sitting duration; sitting position.

Lumbar pain is a major health concern in all industrialized countries, with lumbar pain being diagnosed in 70%–90% of the world population at some period of their lives. The significance of lumbar pain is particularly evident among working individuals in industrialized societies because it is the most important cause of disability in individuals aged less than 45 years. With the rapid development of modern technology, the sitting position has

currently become the most common working position at workplaces. In fact, three-quarters of the workers in industrialized countries need to be seated for long durations at their workplaces<sup>[1]</sup>.

Currently, the etiology of lumbar pain is partially understood, but its progression and persistence are considered the results of interaction among many individual, physical, and psychosocial factors<sup>[2]</sup>. Studies have shown that

**Correspondence (İletişim):** Berna Ürkmez, M.D. Türkiye Sağlık Bilimleri Üniversitesi Fizik Tedavi ve Rehabilitasyon Anabilim Dalı, Haydarpasa Numune Sağlık Uygulama ve Araştırma Merkezi, İstanbul, Turkey

**Phone (Telefon):** +90 506 248 13 53 **E-mail (E-posta):** drbernaurkmez@gmail.com

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the prevalence of lumbar pain among workers who work in a seated position for the majority of a typical work day is higher than that observed in the general population. Long-term computer use, decreased mobility, and non-ergonomic working conditions are the most important causes of lumbar pain in the working environment. According to the literature, the most common musculoskeletal complaints in the office environment are lumbar-associated complaints<sup>[3]</sup>.

Adults usually spend 6–8 h daily or 45%–50% of their time while being awake in the sitting position. Lumbar pain is highly common among some occupational groups such as office workers, bus and truck drivers, heavy industrial workers lifting weights improperly, construction workers, and underground mine workers who are often forced to work while leaning forward<sup>[4]</sup>.

In this study, we aimed to obtain data on whether long sitting durations and the sitting position are the risk factors that increase the severity of lumbar pain among office workers. There are few studies in the literature on the sitting position and sitting duration among office workers. The aim of our study was to determine the correlation between the sitting position and duration and lumbar pain among office workers and to identify associated factors.

## Materials and Methods

### Participants

A questionnaire was developed for individuals with lumbar pain; it comprised of 18 items and 3 main sections about personal information, professional information, sitting position and duration, and lumbar pain. The questionnaire was distributed among 131 office workers working in the sitting position in the municipalities of Uskudar, Kadikoy, Atasehir, and Sile. They were aged between 18 and 65 years, had a mean Body Mass Index (BMI) of  $25 \pm 3.83$  kg/m<sup>2</sup>, and had complaints of lumbar pain.

The inclusion criteria included the following: office workers with complaints of lumbar pain, who were aged between 18 and 65 years, and working in a sitting position. The exclusion criteria included the following: a history of lumbar surgery, diagnosis of cancer or any rheumatic disease, presence of spine-related structural deformity, presence of any psychological disease, and presence of mental disabilities.

A symptomatic case was defined as an individual who reported pain greater than 30 mm in a 100-mm visual analogue scale. Age, height, weight, marital status, educational status, occupation, and chronic diseases of all

participants were recorded. Smoking and exercise habits, which are possible risk factors for lumbar pain, were also recorded. Individuals exercising at least twice a week for at least 30 min were considered to have regular exercise habits.

All participants were asked whether they had lumbar pain at any period of their life and in the past 3 weeks. In the participants with lumbar pain, the nature of the pain and whether the pain extended to the leg were also questioned.

The participants were enquired about their sitting position during the day based on three different positional tendencies: sitting upright, sitting backward, and leaning forward.

All participants included in the study signed an informed consent form prior to their participation, and the local ethics committee approved the study. All procedures were followed in accordance with the ethical principles of the Medical Research and Experiments on Humans (institutional and national) and the 1975 Helsinki Declaration revised in 2013.

### Statistical Analysis

All statistical analyses were performed using the Statistical Package for Social Sciences software (version 22.0; SPSS Inc., Chicago, IL, USA). The Kolmogorov–Smirnov test was used to verify that the data in both the case and control groups were within the normal distribution range. Parametric tests were used for variables with normal distribution. Intergroup comparisons were performed using independent sample t-test and one-way ANOVA test. Pearson correlation test was used in correlation analysis. Statistical confidence interval was set at 95%, and p-value <0.05 was considered statistically significant.

### Results

In total, 131 office workers with lumbar pain were included in this study. Of the participants, 54% were male, 42% had a smoking habit, and 41% had been working for more than 10 years. Further, 71% of the participants were working in the sitting position for more than 6 hours per day. In 53% of the participants, lumbar pain was present for less than 6 weeks. Moreover, 94% of the participants had intermittent lumbar pain during the day. The demographic data of the participants are presented in Table 1.

There were no significant differences between the sitting positions of the participants in terms of daily activity, average daily sleep, percentage of sitting, percentage of standing, percentage of walking, and severity of pain (Table 2).

**Table 1.** Demographic data of the participants

	Mean±SD	n (%)
Age (years)	35±9.3	
Sex		
Female		60 (46)
Male		71 (54)
BMI (kg/m <sup>2</sup> )	25±3.83	
Chronic disease		
HT		3 (2)
DM		4 (3)
CHD		1 (1)
Rheumatic disease		3 (2)
Thyroid disorder		2 (2)
Asthma		10 (8)
None		108 (82)
Educational status		
Primary		1 (1)
High School		28 (21)
University		90 (69)
Graduate degree		12 (9)
Smoking		
Never		61 (47)
Active smoker		55 (42)
Quit		15 (11)
Working duration in the profession (years)		
0–5		42 (32)
5–10		35 (27)
>10		54 (41)
Weekly working duration (hour)		
<40		32 (24)
>40		99 (76)
Sitting duration at work (hour)		
<6		38 (29)
>6		93 (71)
Location of pain		
Only lumbar		90 (69)
Lumbar and leg		41 (31)
Duration of pain (weeks)		
0–6		70 (53)
6–12		35 (27)
≥12		26 (20)
Relation of pain with time		
Never happens		1 (1)
Happens occasionally		123 (94)
Persistent throughout the day		7 (5)

SD: standard deviation; BMI: body mass index; DM: diabetes mellitus; HT: hypertension; CHD: coronary heart disease.

In office workers working for long durations in the sitting position, the percentages of standing ( $p<0,001$ ) was lower and the severity of pain was higher ( $p=0,003$ ), and this difference was statistically significant. However, there was no

significant difference in terms of activity status and average daily sleep based on the sitting duration (Table 3).

There was a negative correlation between BMI and average daily sleep and a positive correlation between age and duration of pain. Further, there was a positive correlation between the duration of pain and percentage of sitting and a negative correlation between duration of pain and percentages of standing and walking. We also found a positive correlation between the severity of pain and percentage of sitting (Table 4).

## Discussion

The aim of our study was to determine the correlation between sitting position and duration and lumbar pain among office workers and to identify the associated factors. There was a correlation between BMI and average daily sleep, age, and duration of pain. There was also a correlation between the duration of pain and sitting and a negative correlation between the duration of pain and percentages of standing and walking. There was also a correlation between the severity of pain and percentage of sitting.

Considering the high prevalence of musculoskeletal disorders, particularly of lumbar pain, among office workers, there is a growing interest in the provision of programs that include physical exercise to prevent and treat musculoskeletal disorders<sup>[5,6]</sup>. In addition to defining health risks and prognostic factors, the implementation of these exercise programs is of utmost importance. The main finding of the present study is that office workers with lumbar pain who are mostly sedentary had lower scores than healthy office workers for most compliance tests. In a study conducted by Spyropoulos et al.<sup>[5]</sup>, 30 healthy office workers and 30 office workers with chronic lumbar pain were randomly selected from a total of 648 office workers. Anthropometric and functional characteristics of the participants were examined, and it was found that lumbar function decreased among female office workers with chronic lumbar pain and lumbar spinal mobility and endurance decreased in the muscles associated with stability<sup>[7]</sup>. In a systematic review that investigated the relationship between back pain and neck pain and physical activity; no clear relationship between physical activity and low back pain was found<sup>[8]</sup>.

In a study conducted by Tanir et al.<sup>[9]</sup>, the frequency of musculoskeletal problems was investigated among the employees of an automotive factory and the effectiveness of exercise and ergonomics training administered to the

**Table 2.** Comparison of clinical data according to the sitting position

	Sitting straight		Sitting back		Leaning forward		p*
	Mean	SD	Mean	SD	Mean	SD	
Daily activity status	4	0.97	4	1.05	4	1.14	0.365
Average daily sleep	3	0.4	3	0.49	3	0.45	0.911
Percentage of sitting	67	15.41	69	12.13	70	14.01	0.555
Percentage of standing	16	8.75	15	6.28	15	7.53	0.752
Percentage of walking	17	9.66	16	11.75	14	9.73	0.501
Severity of pain	3	1.39	4	1.26	4	1.41	0.151

\*One-way ANOVA test; SD: standard deviation.

**Table 3.** Comparison of clinical data according to the sitting duration

	Less than 6 h		More than 6 h		p*
	Mean	SD	Mean	SD	
Daily activity status	4.00	1.09	3.67	1.06	0.107
Average daily sleep	2.84	0.44	2.90	0.44	0.474
Percentage of standing	20.92	8.37	12.96	6.04	<0.001
Percentage of walking	20.66	10.98	13.39	8.94	<0.001
Severity of pain	3.18	1.18	3.96	1.41	0.003

\* t-test; SD: standard deviation.

**Table 4.** Correlation of clinical data

	BMI	Percentage of sitting	Percentage of standing	Percentage of walking
Age				
r	0.201	-0.014	0.017	0.006
p*	0.021	0.87	0.846	0.947
Average daily sleep				
r	-0.179	-0.033	-0.002	0.047
p*	0.041	0.705	0.98	0.591
Duration of pain				
r	0.183	0.297	-0.302	-0.186
p*	0.036	0.001	<0.001	0.033
Severity of pain				
r	-0.092	0.19	-0.167	-0.142
p*	0.296	0.03	0.057	0.106

\*Pearson correlation.

employees who applied for leave due to these problems was evaluated. It was determined that long-term sitting, staying in the same position without mobility, and neck pain was more common among office/white-collar workers, whereas heavy lifting, standing, and lumbar pain were more common among field production/blue-collar workers. After training, a decrease was noted in pain scores

among the office workers<sup>[9]</sup>.

Office work often requires long hours of computer use and desk work, which requires long sitting durations. Prolonged sitting may cause a decrease in joint mobility and muscle strength. Weak lumbar mobility and muscle strength are considered as the risk factors for lumbar pain<sup>[10,11]</sup>.

This study also investigated the relationship between daily life expectancy measurement and diurnal acceleration measurement and back pain intensity among office workers. A positive correlation was observed between total, working, and leisure sitting durations and severity of lumbar pain. The estimates remained largely unchanged after the correction of various individual and work-related factors. These positive correlations between sitting duration and lumbar pain were also confirmed in the analyses based on sitting duration categories.

Most previous studies focused solely on investigating the correlation between working hours and lumbar pain, whereas few studies have been conducted on total sitting duration<sup>[12-14]</sup>.

A number of hypotheses have been proposed to explain the association between BMI and chronic musculoskeletal pain. Obesity is generally considered a proinflammatory condition, and inflammation can be a mediator of the correlation

between obesity and chronic pain<sup>[15]</sup>. Being overweight has been found to be associated with modified serum lipid levels, possibly affecting the feeding of disc cells, and atherosclerosis<sup>[16]</sup>. In addition, a previous study reported that being overweight was associated with disc degeneration in the lumbar spine<sup>[17]</sup>. In our study, we found a close correlation between BMI and duration of pain.

Although the epidemiological evidence of a correlation between sitting duration at desks and lumbar pain is well established, the number of studies investigating the association of specific modifiable behavioral or occupational factors among office workers with non-specific lumbar pain working at a desk is few<sup>[18-20]</sup>. In some studies, it has been suggested that there are some occupational risk factors such as psychosocial stress, long working hours, and poor social support<sup>[21-23]</sup>. Many workplaces involve versatile work, wherein office workers need to constantly rotate their bodies or torsos while working. This increases the load on their lumbar and spine<sup>[24,25]</sup>.

In a study conducted in 2017, Ye et al.<sup>[26]</sup> found that the computer monitor not being placed in front of operators (i.e., on the left or right side) and cold office temperature were interchangeable occupational risk factors for non-specific lumbar pain among office workers using computers.

In conclusion, a history of lumbar pain, a high BMI, and long working durations in the sitting position may be the risk factors for lumbar pain among office workers. This information can be used by clinicians to determine the prognosis of individual patients in primary care. Furthermore, to reduce the incidence of lumbar pain, ergonomic measures should be implemented toward the modifiable risk factors defined in our study and necessary planning should be done.

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