



Type of Sitting Posture and Low Back Pain among University Students

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Abstract

Background: Prolonged sitting may cause faulty posture among students leading to low back pain (LBP). **Objectives:** 1. To compare the time spent sitting among students with and without LBP. 2. To determine the association between types of sitting posture and LBP. **Methods:** This cross-sectional online survey recruited 420 students. **Findings:** A majority (56%) of 343 respondents seated >10 hours daily. There was a significant total time spent between students with and without LBP. However, there was no association between types of sitting posture and LBP. **Implications:** Awareness of avoiding prolonged sitting should be emphasized among the students to minimize LBP.

Keywords: Low back pain; Sitting habits; Sitting posture; Sitting time

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1.0 Introduction

The Covid-19 pandemic has caused significant changes to the academic curriculum, requiring students to continue their academic learning sessions through Online Distance Learning (ODL). This online learning has increased the dependency on computer use among the students as they need to attend daily classes, complete assignments, and discuss with group members virtually. Computer-related work requires users to stay in a static sitting posture with repetitive movements of the upper extremities leading to LBP among university students (Hakala, 2006). Low back pain is a physical problem related to musculoskeletal which is the most common loss-making health issue among work-related musculoskeletal disorders. Low back pain is known as pain in the area between the 12th rib and the inferior gluteal fold. It may present with referred pain or/ and be associated with pain in lower limbs. Besides, LBP could be due to other serious pathologies such as prolapse intervertebral disc (PID), fracture, or tumor.

The prevalence of LBP among young adults was reported from 13% to 30% (Morais et al., (2018); AlShayhan & Saadeddin, (2018)). A high prevalence of LBP which is 74.6% out of 122 Health Sciences students in KPJ Health Care University College was reported by Anggiat et al., (2016). There is a conflicting issue in determining the causes of LBP among them (AlShayhan & Saadeddin, 2018; Morais et al., 2018). Since the implementation of ODL, almost all students were exposed to prolonged sitting periods while attending academic lectures, with long working hours in front of a computer, especially during the Covid-19 Pandemic. Students who are seated for a long time tend to sit and accommodate with poor habitual postures during prolonged computer use (Baer & Cohen, 2023; Calik, Yogci, Gursay, & Zencir, 2014).

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The study by AlShayhan and Saadeddin, (2018), Anggiat et al., (2016), and Moroder et al., (2011) reported significant differences in the consequences of prolonged sitting periods and the presence of LBP. Low back pain develops when sitting periods are about 3 hours (Anggiat et al., 2016) to 10 hours spent on computer use and studying (AlShayhan & Saadeddin, 2018; Moroder et al., 2011). Nevertheless, no study reported the consequences of LBP and sitting postures, even though some said that individuals who sit for prolonged time are prone to stay in improper postures, leading to static muscle load (Casas et al., 2016; Anggiat et al., 2016). So, this limitation gives more support for conducting the current study to understand further the effect of prolonged sitting and faulty postures on LBP. Therefore, this study aimed to compare the time spent sitting among students with and without LBP; and determine the association between types of sitting posture and LBP.

2.0 Literature Review

LBP is one of the most common musculoskeletal disorders in healthcare systems that leads to disability (Morais et al., 2018; Moroder et al., 2011). LBP is no longer a disorder of age-related (AlShayhan & Saadeddin, 2018; Moroder et al., 2011) since it is currently present in all levels of age groups. Low back pain is a burden to the country's economic state (Casas et al., 2016; Moroder et al., 2011) because persons with LBP might have frequent hospital visits and the same will increase works absenteeism (Casas et al., 2016; Morais et al., 2018). Casas et al. (2016) and Moroder et al. (2011) reported that LBP interferes with the quality of life (QOL), which lead to a better understanding of the reason for the reduction in the quality of job performance. AlShayhan and Saadeddin (2018) mentioned that presenting with LBP among health science students can affect job performance in the future while delivering health services to clients that may affect their professionalism and level of confidence.

2.1 Risk factors of LBP

Bontrup et al. (2019) and Morais et al. (2018) stated in their articles that LBP is multifactorial. Based on a systemic review by Meucci et al. (2015), the identified risk factors of LBP are age, gender, economic status, lifestyle, and occupation. Individuals with age older than 50 years old are more prone to present with LBP compared to those aged 18-30 years old. The low back pain might be due to the changes in the spinal structures. Women are highly exposed to LBP may be due to pregnancy, housekeeping, working, and childcare. Besides, low back pain is influenced by smoking because the contained nicotine will increase the rate of joint degeneration.

Aside from that, individuals that reported low economic status present with a high prevalence of LBP. This factor is influenced by the types and nature of their work or occupations. Furthermore, the jobs that require high spinal loading presented high LBP. The article also mentioned that lifestyle also affects the presentation of LBP, using computers for work, and having a sedentary lifestyle.

A study by Morais et al., (2018) reported risk factors that significantly affect the prevalence of LBP among physiotherapy students are social class, course year, and physical activity level, with p values $p=0.017$, $p=0.011$, $p=0.022$, respectively. Last year students presented with a high prevalence of LBP compared to others. As stated by AlShayhan and Saadeddin (2018), the risk factors of LBP include psychological factors, trauma in the back area, a heavy backpack, longer sitting time, and poor sitting posture. AlShayhan and Saadeddin (2018) confirmed the association of LBP with sitting time with a significant p -value, $p=0.002$. However, their study did not evaluate the association between LBP and habitual sitting posture, even though sitting posture is one of the risk factors for LBP among students.

2.2 Sitting Posture

According to AlShayhan & Saadeddin (2018), sitting for a prolonged time and sitting with a bad posture are the risk factors for LBP among students. During the Covid-19 pandemic, students spent most of their time using computers, leading to prolonged time spent sitting, which exposed them to the risk of having LBP. However, O'Sullivan et. al (2012) found no association between LBP and prolonged sitting time. It includes sitting in improper sitting posture and improper sitting movement, and static bad body posture for long periods (Hakala et al., 2006; Anggiat et al., 2016), which contribute to the isometric muscles contraction of working muscles. The working muscles that did not recover well tend to present with muscle fatigue.

Sustained changes in body positions (habitual posture) can contribute to the longer alteration of spinal load and will heighten any adverse effects caused by the alteration of spinal load (Straker et al., 2007). Aside from that, any temporary changes to body posture during sitting might lead to permanent habitual sitting posture because of the neuromusculoskeletal adaptation. The adaptation depends on the muscle stimulation period (Straker et al., 2007). Based on a review of a few articles shows that poor habitual postures can contribute to the presence of LBP among health sciences students. Future understanding of the association is needed to avoid the increase in the prevalence of LBP among health sciences students.

2.3 Association of Time Spent Sitting, Sitting Posture, and LBP

LBP is multifactorial, yet prolonged sitting time and sitting posture might be the important contributing factors to the presence of LBP among students, especially during the Covid-19 pandemic. It is due to changes in academic curriculum that require them to spend many hours using the computer, and they tend to sit in improper posture. This scenario leads them prone to a sedentary lifestyle and increases low back pain.

A study conducted among workers showed a positive result when it demonstrated that the sitting period contribute to LBP (Gupta et al., 2015). Seventeen percent of 209 workers report presenting with chronic LBP, with intensity of pain greater than five assessed using a standardized Nordic Questionnaire, and 58% of workers that complained of pain intensity level more than five spent time sitting

more than 8 hours per day. Nevertheless, the result of this study might present a higher percentage if the workers are from the standardized working pattern.

Moroder et al. (2011) identify the consequences of working a sedentary lifestyle, being physically inactive, and low back pain. In this study, medical students have reported to present with a longer time sitting and low physical activity, while physical education students presented with less sitting time and a higher level of physical activity. They demonstrated significant differences $p < 0.001$ for both sitting time and physical activity. Yet, differences in both factors do not influence the presence of LBP between both groups. Anyhow, this result may be due to the inclusion and exclusion criteria which was not mentioned earlier in the article by the authors.

Moreover, Fernandes et al. (2015) also measure the effect of a sedentary lifestyle among school children and LBP. But the study shows different results of watching TV and computer use on LBP, in which watching TV is more related to the presence of LBP than the use of the computer. Though, it may be due to the smaller number of students using computers at that time and not focusing on ODL.

From all reviewed studies, there is limited study on the association of sitting posture and LBP although sitting posture is one of the major contributing factors to the incidence of LBP among students, as mentioned by AlShayhan and Saadeddin (2018) and Straker et al., (2007).

Bontrup et al. (2019) investigated the effect of LBP on subjects sitting behaviors and found people with LBP sit with less static posture and present with less mobility. It is a further understanding that presenting with low back pain will influence the sitting behaviors. But, in this study, we want to determine the contribution of sitting posture on LBP.

In a nutshell, it is essential to identify the most common contributing factor to LBP among students due to this limited evidence. To this extent, it is not well known that time spent sitting, and habitual postures during sitting play an essential role in LBP.

3.0 Method

A cross-sectional study was conducted which recruited 420 students from the Faculty of Health Science, Universiti Teknologi MARA (UiTM), Puncak Alam Campus, Malaysia. This study used a self-administered questionnaire adopted from Casas et al. (2016) that consists of questions about the daily time spent by the students sitting, the usual type of posture during sitting, and sitting habits adapted during sitting. The sitting time that spent was measured using an hour. The type of posture identified using pictures that illustrated in the questionnaire. Besides, a Nordic musculoskeletal questionnaire was also used to assess the presence of LBP. These questionnaires were distributed through an online platform via a Google form.

The participants, either males or females, aged 19- to 24-year-old, studied full-time mode and no other chronic diseases were included in this study. They were excluded when they were aged less than 19 and above 24 years old, studied in part-time mode, worked part-time that might contribute to LBP, and known cases of any cardiovascular disease, chronic disorder (respiratory, kidney, pelvic, gastrointestinal), malignancy, or any systemic problem.

The data were analyzed using IBM SPSS Statistics software Version 20 for descriptive and inferential statistics. The demographic characteristics of the participants were analyzed using descriptive analysis. The independent t-test used to compare the mean difference of the total time spent sitting between the students with LBP and without LBP while the Chi-Square test used to analyze the association between types of sitting posture and the presence of LBP.

4.0 Results and Discussion

4.1 Demographic result

There were 420 participants in this study. However, only 343 participants were included for analysis and others were excluded because they did not meet the study requirement. The demographic characteristics of the participants are illustrated in Table 1.

Table 1: Demographic characteristics of the participants (N=343)

Variables	n (%)	Mean ± SD
Age		22.04 ± 1.38
19-20	64 (19)	
21-22	127 (37)	
23-24	152 (44)	
Height (cm)		159.66± 9.20
Weight (kg)		58.29± 13.00
Gender		
Female	256 (75.0%)	
Male	87 (25.0%)	
LBP status		
Yes	206 (60.06%)	
No	137 (39.94%)	
Range of sitting hours		
< 5 hours	33 (9.6%)	
Between 5-10 hours	118 (34.4)	
> 10 hours	192 (56.0%)	
Type of sitting posture		
A (Kyphotic posture)	82 (23.9%)	
B (spine straight with controlled lumbopelvic)	51 (14.9%)	
C (lumbar hyperlordotic)	126 (36.7%)	
D (slouched posture)	39 (11.4%)	

None of the above 45 (13.1)

Notes:

- A: seat with a rounded shoulder (Kyphotic posture)
- B: Seat with back straight but with lumbar hyper-lordosis
- C: Seat with good back posture (spine straight) and controlled lumbopelvic
- D: Seat with upper back supported but reverse lumbar curvature (slouched posture)
- None: not seat in any of the postures stated above

4.2 Frequent sitting habit adopted in sitting

The frequent sitting habits adopted in sitting during ODL are illustrated in Table 2.

Table 2: Sitting habits adopted during ODL

Variables	n (%)	n (%)
Sitting habits	Yes	No
Frequently change sitting position	281 (94.3)	17 (5.7)
Frequently stretching	226 (37)	72 (24.2)
Armrest of working table at elbow height	225 (75.5)	73 (24.5)

4.3 Association between an hour spent sitting and the presence of LBP

There is a significant difference between the students with LBP and NLBP in the total time spent per day sitting to complete academic requirements demonstrated in Table 3.

Table 3: Mean difference between sitting time and presence of LBP

Variables	NLBP (n=137) Mean (SD)	LBP (n = 208) Mean (SD)	Mean diff (95 % CI)	t-stats (df)	P-Value
Total time spent in sitting per day	12.21 (7.07)	14.97 (7.34)	-2.77 (-4.32, -1.21)	-3.49 (298.97)	0.001

Notes:

- P-value < 0.05 is significant
- NLBP is non-low back pain
- LBP is low back pain

4.4 The association between the type of sitting posture and LBP

There is no significant association between types of sitting posture and LBP presented in Table 4.

Table 4: The association between the types of sitting posture and LBP among the participants (N= 298)

Types of sitting posture	LBP n (%)	NLBP n (%)	X2 Statistic (df)	P-value
A	47 (57.3%)	35 (42.7)	5.59 (3)	0.134
B	37 (72.5)	14 (27.5)		
C	71 (56.3)	55 (43.7)		
D	27 (69.2)	12 (30.8)		

The findings from the current study show a high prevalence of LBP among health science students in the Universiti Teknologi MARA which is similar to the previous studies (AlShayhan & Saadeddin, 2018; Casas et al., 2016; Chiwaridzo et al., 2018; Anggiat et al., 2016; Morais et al., 2018; Moroder et al., 2011). Previous studies also reported the contributing factors to low back pain include sleeping habits, lifting a heavy backpack, and prolonged sitting time. Prolonged sitting either with or without the use of a computer and tablet is strongly related to the occurrence of LBP (AlShayhan & Saadeddin, 2018; Anggiat et al., 2016; Moroder et al., 2011). Besides, students who sit more than 10 hours per day are highly related to the presence of LBP is consistent with the findings by AlShayhan and Saadeddin (2018). This explained that prolonged sitting or sustained sitting posture might increase compression load in the vertebra and intervertebral disks. This will stimulate nociceptors and mechanoreceptors to detect pain and lead to the presence of LBP (Anggiat et al., 2016).

However, the studies by Anggiat et al. (2016); and Arsh and Jan (2015) reported that students who spent time sitting for more than 3 hours also experienced LBP, and the incidence was higher than those who spent time sitting for less than 3 hours. Nevertheless, students who spent less than 3 hours' time sitting present with LBP too, but the occurrence could be interrelated to failure in practicing good sitting posture and habits that contributed to their LBP.

A study has mentioned the importance of dynamic sitting and good sitting posture (Bontrup et al., 2019), yet very little is known to measure the relationship between sitting posture and the presentation of LBP. The current study found no significant association between the type of sitting posture and the incidence of LBP. Despite many students sitting in good posture and having straight spines with controlled lumbopelvic, the incidence of LBP among them was higher than non-LBP. the result could be due to the good sitting habits practiced by the students. Good sitting habits refer to the frequent changes in sitting position, regular stretching, and the use of good ergonomic characteristics into the study's furniture. It's believed that practicing good sitting habits could positively affect the biological and physiological of the body during sitting postures, and later will reduce the internal loading to the spinal body and structures. Frequent changes in position during sitting can also reduce muscle fatigue and prevent damage to the spinal shock absorbers' that are known as vertebral discs. The method of analyzing the types of sitting posture and sitting habits requires improvement to achieve better

study results.

There are several limitations identified in this study. One of them is majority of the participants are females (75%). This shows inequality of gender and could lead to a bias finding since the previous evidence showed females are prone to LBP. Another limitation is this study recruited students from only one center. Although they are from the different Health Sciences programs, they perhaps already embedded some knowledge in managing low back pain from their exposure and learning ergonomics and postures in some programs (examples: physiotherapy, occupational therapy, and environmental health). Thus, lead to a non-significant association between types of sitting posture and LBP.

This study provides evidence of the sitting hours, types of sitting posture and low back pain among the university. The findings may support the physiotherapist to develop health program to enhance understanding, create awareness as well as the preventive measures for low back pain. This hopes to improve the wellbeing, healthy active lifestyle, and quality of life of the students in the university.

5.0 Conclusion

Based on this present study, it's concluded that hours spent sitting contribute more to the incidence of LBP than the types of sitting posture adopted when completing the academic requirement during the Covid-19 Pandemic. With the highly significant result, students should be alert about LBP and prevent themselves from this incidence at an early age as it could affect their future. As for sitting posture, even though this study did not demonstrate the association of sitting posture with the occurrence of LBP, proper sitting posture and sitting habits should be practiced and adapted throughout the current academic curricular. Good sitting posture and sitting habits might lessen the strain on the trunk structure. Further research needs to explore types of sitting posture and LBP among students in different universities or institutions.

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Paper Contribution to Related Field of Study

This paper contributes to Physiotherapy, Public Health, Health, and Wellbeing

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