

The Correlation Between The Sitting Posture and Duration With LBP Complaints in Nursing Students During Lecture Activitie

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Received : Desember 10, 2023

Accepted : Desember 30, 2023

Published : January 10, 2024

Citation: Pattimura, N., Makatita, S, Pattimura, N, A., Tihurua, M, A. The Correlation Between The Sitting Posture And Duration With LBP Complaints In Nursing Students During Lecture Activities. Medicor : Journal of Health Informatics and Health Policy, 2(1), 51-61.

<https://doi.org/10.61978/medicor.v2i1>

ABSTRACT: Lower Back Pain (LBP) is a frequently reported issue among people in different domains, including students enrolled in nursing education programmes. Nursing students frequently endure prolonged periods of sitting during their participation in lecture activities. An unergonomic sitting posture and extended periods of sitting can increase the likelihood of experiencing lower back pain (LBP) complaints. This study investigated the correlation between sitting posture and duration and the occurrence of low back pain (LBP) complaints in nursing students at the College of Health Sciences of Pasapua Ambon. This research methodology was characterised by its analytical nature and relies on primary data collected using a cross-sectional approach. A total of 76 participants were included in the study, and they were provided with a Google form including a questionnaire to complete. The acquired data was subsequently examined using both univariate and bivariate methods. The findings indicated no statistically significant correlation between the sitting posture and complaints of lower back pain (LBP). A notable correlation existed between the amount of time spent sitting and lower back pain (LBP) symptoms. These findings suggest that focusing on the amount of time spent sitting rather than the specific sitting posture to reduce lower back pain complaints among university students is more crucial. This highlights the necessity of restricting extended periods of sitting while also emphasising the importance of taking sufficient breaks and engaging in frequent stretching

Keywords: Lower Back Pain (LBP), sitting posture, sitting duration, nursing students.



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INTRODUCTION

Low Back Pain (LBP), or low back pain, is one of the most common health problems individuals worldwide face (Tifani et al., 2023). According to (Safira et al., 2023), LBP is the leading cause of activity limitation and work absence and results in enormous medical burdens and economic costs. The prevalence of LBP in 2017 was estimated to be around 7.5% of the total world population, equivalent to approximately 577.0 million individuals (Tamrakar et al., 2021). The results of (Purwata et al., 2015) stated that the prevalence of low back pain reached 21.8% of 8,160

participants from 13 cities in Indonesia. The number of LBP sufferers is increasing over time, as evidenced by data from the WHO (World Health Organization) in 2020, which noted that 619 million individuals worldwide experience BP. It is estimated that cases will increase to 843 million by 2050. The cause of this increase is mainly due to global population growth and the increasing age of the population. The age group of 50-55 years and women have the highest prevalence of LBP sufferers (W.H.O., 2023).

Nursing students are an essential part of the academic community and are often caught up in long periods of sitting during lectures and independent study (Gallagher-Lepak et al., 2009; Huijser et al., 2008). They spend hours seated in long classes and preparing lecture material or essential assignments. These academic activities often require high concentration and depth. Nursing students must pay attention to essential details and understand complex medical information (DeWit & Williams, 2013; Stuart, 2012; Zaccagnini & Pechacek, 2019). This can cause them to become immersed in their work without paying attention to their physical health. Nursing students neglect good posture and ergonomics in situations requiring such high concentration. They may sit in inappropriate positions or use chairs that lack support, increasing the risk of muscle strain and discomfort in the lumbar region (Wardaningsih, 2010).

Sitting is a routine activity performed by university students, where their body position, particularly the hips, plays a role in supporting the upper body weight and experiencing limited movement (Doorenbosch et al., 1994; Peterson et al., 2015). The link between the time spent sitting and sitting posture has been recognised as two critical factors closely related to the onset of Low Back Pain (LBP) (Anggraika, 2009). Long duration of sitting, significantly if it exceeds four hours per day, has been identified as a risk factor contributing to LBP (Kusumaningrum et al., 2021). A range of personal physical including poor back muscle endurance (Moffroid et al., 1994), reduced cardiovascular fitness (Cady et al., 1979), altered motor control patterns (Cholewicki et al., 2005), poor spinal posture (Dankaerts et al., 2006), and reduced sagittal range of motion (Wong and Lee, 2004) have been found in various LBP populations. In addition, several other risk factors also influence the prevalence of LBP, such as age, gender, body mass index, ergonomics, tenure, smoking habits, and exercise habits (Rahmawati, 2021).

Several previous studies have shown that sitting posture and sitting duration impact the onset of LBP complaints, including research from (Chen et al., 2017), which found that students with non-ergonomic sitting postures and long sitting duration have a higher risk of experiencing BP. (Smith et al., 2019) also reported that students who sit long during college activities have a higher chance of developing LBP complaints. Research by (Puolakka et al., 2020) also shows that students with longer sitting durations have a higher tendency to experience BP. In addition, the results of (Park et al., 2018) also showed that non-ergonomic sitting postures are associated with an increased risk of LBP in university students. (Pillai & Haral, 2018) shows that Data analysis concluded that low back pain was more prevalent in individuals with sitting working postures than standing. However, some studies have also shown that there is no association between sitting position and duration with the incidence of LBP. (Josephson and Vingard 1998; Kerr et al. 2001; Clays et al. 2007) or a very weak association (Hoogendoorn et al. 2001; Jansen et al. 2004).

Although several studies have been conducted in this context, specific research has not investigated the relationship between sitting posture and duration with Low Back Pain (LBP)

complaints in nursing students, particularly at the College of Health Sciences of Pasapua Ambon. This raises the need for more specialised and in-depth research to understand the risk factors contributing to LBP among nursing students at the institution. A study focused on nursing students at the College of Health Sciences of Pasapua Ambon could provide valuable insight into the specific characteristics of this population, as well as environmental and lifestyle factors that may influence the incidence of LBP.

METHOD

Research Design

This study employed a correlational research methodology utilising a cross-sectional approach, elucidating the relationship between events co-occurring or at a specific time.

Population

The study population consisted of all students enrolled in the Nursing Study curriculum at the College of Health Sciences of Pasapua Ambon, totaling 381 people.

Sampling Technique

The sample size was determined using the unpaired categorical analytic formula (Dahlan, 2013). The computation findings indicated that 38 samples were used, resulting in a total minimal sample size of 76 samples for this study.

Research Variables

1. The independent variable, often known as the free variable *e*, is not influenced by any other variables in the study. The independent factors examined in this study include the position in which individuals sit and the time they sit.
2. The dependent variable (the outcome variable) is denoted as "*e*." This study measures complaints related to lower back discomfort during college activities.

Research Instruments

The research instrument employed in this study was a questionnaire. The validity and reliability of instruments measuring sitting posture, sitting duration, and complaints of low back discomfort have been assessed. The validity test of the sitting posture questionnaire revealed that all assertions regarding sitting duration and low back discomfort were confirmed to be genuine. The Cronbach's alpha value for the reliability test calculation of the sitting posture questionnaire was determined to be 0.704. In contrast, the duration of sitting acquired a value of 0.664, and Low back pain obtained a value of 0.900. These results show that the questionnaire's sitting posture, length of sitting, and Low back pain are considered reliable.

Data Collection Procedure

Data collection refers to quantifying and gathering information on a particular entity or a set of entities. The researcher obtained the data in this study independently. The methodology for data collection in this study is outlined as follows:

1. Explained the purpose of the study and the procedure for completing the questionnaire
2. Give informed consent to the respondents
3. Researchers distributed questionnaire links to be filled in through Google form
4. Perform data processing and analysis.

Data analysis

Univariate analysis

Univariate analysis will be performed to determine the variables of age, gender, sitting posture, sitting duration, and low back pain components. The results of this research will be presented in a frequency distribution table.

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In order to assess the correlation between sitting posture, sitting duration, and the occurrence of low back pain, the chi-square test is employed using the Statistical Package for the Social Sciences (SPSS) 24.00 software. The test is conducted with a significance level of $\alpha < 0.05$. If the calculated p-value $< \alpha$ (0.05), the alternative hypothesis (H_a) is accepted. Conversely, if the p-value $> \alpha$ (0.05), the null hypothesis (H_o) is accepted.

RESULT AND DISCUSSION

ANALISIS UNIVARIAT

Table 1 presents a univariate study of gender, age, sitting posture, sitting duration, and low back discomfort.

Table 1. Distribution of respondents

Variable	n	%
<u>Gender</u>		
Male	12	15,8
Female	64	84,2
<u>Age</u>		
<18 years	4	5,3
18-20 years	52	68,4
>20 years	20	26,3
<u>Sitting posture</u>		
Not ergonomic	0	0
Less ergonomic	52	68,4
Ergonomic	24	31,6

<u>Duration of sitting</u>		
Short	27	35,5
Medium	38	40,0
Long	11	14,5
<u>Low back pain (LBP) complaints</u>		
Mild	19	25,0
Moderate	31	40,8
Severe	22	28,9
Very severe	2	5,3

The data presented in Table 1 indicates that out of the total respondents, 64 individuals (84.2%) were female, whilst 12 individuals (15.8%) were male. According to age, there were 52 responses (68.4%) in the 18-20 year age group; on the other hand, the group with the fewest replies was those under < 18 years old, with only 4 respondents (5%). Most of the respondents, precisely 52 individuals (68.4%), had sitting postures that were less ergonomic. On the other hand, 24 respondents (31.6%) had ergonomic sitting postures. The study revealed that a significant number of respondents, precisely 38 individuals (50.0%), reported a moderate duration of sitting. Conversely, only 11 respondents (14.0%) reported a long duration of sitting, which was the least common category. Upon examining the LBP complaints reported by students, it was observed that 31 respondents (40.8%) had moderate category LBP problems; on the other hand, only 4 respondents (5.3%) reported very severe category LBP complaints.

Sitting posture of Nursing Students

The seated position is commonly regarded as the most comfortable for attending lectures. However, it is essential to note that sitting for prolonged periods can exert significant strain on the lumbar region, potentially leading to discomfort and suffering (Milenia, 2022). The data in Table 1 indicates that most respondents, precisely 52 individuals (68.4%), have sitting postures that fall into the less ergonomic group. On the other hand, 24 respondents (31.6%) had ergonomic sitting postures. This suggests that most participants will likely adopt a posture that provides less support for spinal health and overall posture.

Sitting is a habitual activity that we frequently engage in daily. Prolonged periods of sitting can lead to physical discomforts such as muscle tightness. Slouching can lead to discomfort in the lumbar region and waist (Saiklang et al., 2021). Sitting requires the use of body parts, particularly the hips and thighs, to provide support for the upper body. This can restrict the range of body movement (Anggraika et al., 2019). Repetitive sitting activities performed without proper attention to ergonomic positions can lead to discomfort, muscle spasms, muscle tension, neck pain, and an elevated risk of accidents resulting from prolonged periods of sitting without changing positions (Alrashed, 2016; Kim & Junggi Hong PhD, 2013; Todd et al., 2007). Additionally, it can heighten the likelihood of experiencing back pain. Prolonged maintenance of a seated position can impede concentration throughout the learning process due to the compression of different limbs, leading to circulatory disturbances (Puti & Rosady, 2022).

Optimal sitting postures are essential as they help mitigate grievances and health issues associated with muscles, spine, and soft tissues. For instance, prolonged sitting in an incorrect posture can

lead to stiffness and tension in the muscles of the lumbar area (Manery et al., 2023). (Casas et al., 2016) state that several aspects, such as chair and desk design, illumination, and visual requirements, impact ergonomic sitting postures. Furthermore, apart from these considerations, sitting time might also worsen the likelihood of experiencing back pain. Extended periods of sitting in an improper posture increase the likelihood of developing lower back discomfort. While studying at home, numerous students spend a significant amount of time sitting at desks and chairs that do not adhere to ergonomic principles, hence heightening the risk of developing musculoskeletal issues. It is advisable to occasionally change postures when sitting for extended periods to decrease the likelihood of experiencing LBP (low back pain), lumbar discomfort, weariness in the back muscles, and occupational, mental, and physical exhaustion.

Research findings from (Kasumawati et al., 2020) showed that back-office employees have LBP complaints at moderate disability levels, 40.9% aged under 35 years, and working time over 8 hours, while 45.5% of employee work postures need improvement. The results of the analysis there is a correlation between the length of work, work posture with LBP complaints among back-office employees at X Hospital. So the need to provide ergonomic work facilities, especially in the back-office. Stretching interrupted work time can also be done by employees in utilizing a good time while working to reduce LBP complaints.

Nursing Student Sitting Duration

The study revealed that a significant number of respondents (50.0%) had a moderate sitting length, whereas a smaller proportion (14.0%) had a long sitting duration. This data indicates that most participants tend to sit for a modest duration, suggesting they do not frequently engage in prolonged sitting. Nevertheless, a minority of participants tend to remain seated for prolonged durations, hence elevating the likelihood of experiencing health issues such as low back pain (LBP).

Extended periods of studying or sitting during lectures can lead to emotional distress, which is a prevalent issue among students. Prior research has indicated that medical students, who frequently encounter elevated levels of stress throughout their study period and dedicate extensive time to academic pursuits, are particularly susceptible to experiencing low back discomfort (Fitriani et al., 2021). Prolonged sedentary behaviour combined with psychological stress can lead to a decline in body alignment and an elevated susceptibility to experiencing discomfort in the lower back (Amelot et al., 2019; Taha et al., 2023). Furthermore, the research finding by (Keskin et al., 2021) also indicate that a history of lumbar pain, high BMI, and long sitting duration at work may be the risks factors for lumbar pain among office workers.

Complaints of Low Back Pain (LBP) in Nursing Students

The data presented in Table 1 indicates that most student-reported LBP concerns fall into the moderate group, with 31 respondents (40.8%) out of the total number of respondents. Conversely, the number of complaints regarding LBP in the severe group was the lowest, with only four respondents (5.3%) out of the total number of respondents. Lower back pain (LBP) is distinguished by a sensation of burning, sharp pain, and limited mobility in the lower back, which persists even during periods of relaxation.

The prevalence of complaints regarding mild low back pain in nursing students in this study is believed to be attributed to prolonged periods of sitting in a sedentary position during lectures.

Consequently, pupils experience discomfort in specific body regions due to adopting a less ergonomic sitting posture. This assumption aligns with the viewpoint of Ricca et al. (2020), who assert that complaints of lower back pain (LBP) are more likely to occur when individuals are in a sedentary position, specifically while sitting, due to excessively strenuous activity. This can lead to rapid fatigue in the body. According to Barus et al. (2023), students who maintain a non-ergonomic dominant body position during lectures are 2.35 times more likely to experience complaints of lower back pain (LBP) compared to students with an ergonomic dominant body position.

BIVARIATE ANALYSIS

Bivariate analysis determined the relationship between sitting posture and duration with complaints of low back pain. The results of the analysis can be seen in table 3.

Table 2. Distribution of the relationship between sitting posture and duration with LBP complaints

Variable	<i>Low Back Pain</i> complaints								Total		<i>P-value</i>
	Mild		Medium		Severe		Very severe				
	n	%	n	%	n	%	n	%	n	%	
<u>Sitting posture</u>											
Less ergonomic	11	21,2	21	40,4	18	34,6	2	3,8	52	100	0,329
Ergonomic	8	33,3	10	41,7	4	16,7	2	8,3	24	100	
<u>Duration of sitting</u>											
	15	55,6	9	33,3	3	11,1	0	0,0	27	100	0,000
Short	4	10,5	21	55,3	12	31,6	1	2,6	38	100	
Medium	0	0,0	1	9,1	7	63,6	3	27,3	11	100	
Long											

The Mann-Whitney Test results indicate that the p-value for the sitting posture is 0.329, suggesting no statistically significant association between sitting posture and complaints of lower back pain (LBP). The findings of this study align with the research conducted by (Barus et al., 2023), which also found no correlation between sitting position at the College of Health Sciences of complaints of low back pain (LBP) during online lectures for second-year Ners students at STIKes Santa Elisabeth Me an. Furthermore, the findings of the study conducted by (Pratami et al., 2019) revealed a p-value of 0.645 ($P > 0.05$), suggesting that there is no significant correlation between sitting posture and complaints of lower back pain (LBP) among first and second-year students in the medical faculty at YARSI University.

The study found no correlation between a sitting posture and complaints of low back pain (LBP), potentially because students often do not maintain a consistent sitting posture during lectures. Students frequently alter their sitting posture to alleviate physical pain when in a stationary seated position. The potential for fluctuation in a sitting posture may impact the study's findings, resulting in the absence of a significant correlation between a sitting posture and complaints of lower back pain (LBP).

The findings also indicated that 11 participants (21.2%) reported minor complaints of lower back pain (LBP) when sitting in a less ergonomic position. Additionally, 21 participants (40.4%) fell into the moderate group, 18 participants (34.6%) fell into the severe category, and 2 participants (3.8%) fell into the very severe category. The study on ergonomic sitting postures revealed that out of the total respondents, 8 individuals (33.3%) reported mild complaints of lower back pain (LBP), 10 individuals (41.7%) reported moderate complaints, 4 individuals (16.7%) reported severe complaints, and 2 individuals (8.3%) reported extremely severe complaints.

The data in Table 2 demonstrates that the p-value for sitting duration is 0.000, demonstrating a statistically significant correlation between sitting length and complaints of lower back pain (LBP). The observed correlation in this study is believed to be attributable to the prolonged periods of sedentary behaviour commonly exhibited by students. Engaging in offline and online lectures and assignments, which involve writing papers and developing PowerPoint presentations, sometimes necessitates prolonged student sitting periods. Prolonged sitting can lead to excessive strain and disturbance of the lumbar vertebrae. Prolonged sitting can lead to decreased joint lubrication and stiffness in the lumbar region, leading to discomfort and an increased risk of lower back pain in students (Manery et al., 2023).

Table 2 indicates that out of the respondents with a short sitting duration, 15 individuals (55.6%) reported experiencing lower back pain (LBP) complaints. In comparison, 9 individuals (33.3%) fell into the moderate category, and 3 individuals (11.1%) fell into the severe category. During the medium sitting length, 10.5% of the respondents had mild lower back pain (LBP) symptoms, 55.3% reported moderate complaints, 31.6% reported severe complaints, and 2.6% reported severe complaints. During the extended period of sitting, one participant (9.1%) had mild symptoms of lower back pain (LBP), whereas seven participants (63.6%) experienced severe LBP, and three participants (27.3%) reported extremely severe LBP.

CONCLUSION

Based on the findings and analysis, it can be inferred that there is no significant correlation between the sitting posture and complaints of lower back pain (LBP). Furthermore, the p-value for sitting time is 0.000, which signifies a significant correlation between sitting duration and complaints of lower back pain (LBP). The outcomes of this study directly influence educational institutions' decision-making regarding the enhancement or provision of facilities that promote ergonomics, such as personalised sitting and desks, cosy study areas, and amenities for engaging in gentle physical exercises during breaks between study sessions.

REFERENCE

Alrashed, W. A. (2016). Ergonomics and work-related musculoskeletal disorders in ophthalmic practice. *Imam Journal of Applied Sciences*, 1(2), 48–63.

- Amelot, A., Mathon, B., Haddad, R., Renault, M. C., Duguet, A., & Steichen, O. (2019). Low back pain among medical students: a burden and an impact to consider! *Spine*, 44(19), 1390–1395.
- Anggraika, P., Apriany, A., Pujiana, D., & Medika, A. (2019). Hubungan Posisi Duduk Dengan Kejadian Low Back Pain (Lbp) Pada Pegawai Stikes. *Jurnal'Aisyiyah Medika*, 4(1), 1–10.
- Barus, M., Rupang, E. R., & Lahagu, E. (2023). Hubungan Posisi Dan Lama Duduk Dengan Keluhan Low Back Pain Selama Kuliah Online Pada Mahasiswa Tingkat II Prodi Ners Di Stikes Santa Elisabeth Medan Tahun 2022. *Jurnal Cakrawala Ilmiah*, 3(1), 161–166.
- Cady, L. D., Bischoff, D. P., O'Connell, E. R., Thomas, P. C., & Allan, J. H. (1979). Strength and fitness and subsequent back injuries in firefighters. *Journal of Occupational Medicine*, 269–272.
- Casas, S., S., A., Patiño, S., S., M., Camargo, L., & M, D. (2016). Association between the sitting posture and back pain in college students. *Revista de la Universidad Industrial de Santander. Salud*, 48(4), 446–454.
- Chen, I. H., Wang, S. M., & Tang, F. I. (2017). Incidence and risk factors of low back pain in junior high school students: A prospective 18-month study. *Journal of Back and Musculoskeletal Rehabilitation*, 30(5), 1013–1020.
- Cholewicki, J., Silfies, S. P., Shah, R. A., Greene, H. S., Reeves, N. P., Alvi, K., & Goldberg, B. (2005). Delayed trunk muscle reflex responses increase the risk of low back injuries. *Spine*, 30(23), 2614–2620.
- Dankaerts, W., O'Sullivan, P., Burnett, A., & Straker, L. (2006). Differences in sitting postures are associated with nonspecific chronic low back pain disorders when patients are subclassified. *Spine*, 31(6), 698–704.
- DeWit, S. C., & Williams, P. A. (2013). *Fundamental concepts and skills for nursing*. Elsevier Health Sciences.
- Doorenbosch, C. A., Harlaar, J., Roebroek, M. E., & Lankhorst, G. J. (1994). Two strategies of transferring from sit-to-stand; the activation of monoarticular and biarticular muscles. *Journal of Biomechanics*, 27(11), 1299–1307.
- Fitriani, T. A., Salamah, Q. N., & Nisa, H. (2021). Keluhan Low Back Pain Selama Pembelajaran Jarak Jauh pada Mahasiswa UIN Syarif Hidayatullah Jakarta Tahun 2020. *Media Penelitian dan Pengembangan Kesehatan*, 31(2), 133–142.
- Gallagher-Lepak, S., Reilly, J., Killion, M., & C. (2009). Nursing student perceptions of community in online learning. *Contemporary Nurse*, 32(1–2), 133–146.
- Huijser, H., Kimmins, L., & Galligan, L. (2008). Evaluating individual teaching on the road to embedding academic skills. *Journal of Academic Language and Learning*, 2(1), 23– 38.
- Kasumawati, F., Adha, M. Z., Azizah, F. N., Ramuni, K., & Katta, R. (2020). Correlation Between Length of Work and Work Posture With Low Back Pain Complaint among Back Office Employees at X Hospital Serpong District. *South Tangerang, Indonesia*, 16(8), 34–37.

- Keskin, Y., Ürkmez, B., Öztürk, F., Kepekçi, M., & Aydın, T. (2021). Correlation between sitting duration and position and lumbar pain among office workers. *Haydarpaşa Numune Medical Journal*, 61(1), 1.
- Kim, S. E., & Junggi Hong PhD, A. T. C. (2013). Ergonomic interventions as a treatment and preventative tool for work-related musculoskeletal disorders. *International Journal of Caring Sciences*, 6(3), 339.
- Kusumaningrum, D., Samara, D., Widyatama, H. G., Parwanto, M. E., Rahmayanti, D., & Widyasyifa, S. A. (2021). Postur tubuh dan waktu duduk dengan keluhan nyeri punggung bawah (LBP). *Jurnal Ilmiah Kesehatan Sandi Husada*, 10(1), 74–81.
- Manery, D. E., Ramadhany, M. R., Ukratalo, A. M. dan P., & O, V. (2023). Hubungan Posisi Dan Lama Duduk Dengan Keluhan Low Back Pain (LBP) Selama Kuliah Pada Mahasiswa Semester Pertama Jurusan Biologi Universitas Pattimura Tahun 2023. *JHN: Journal of Health and Nursing*, 1(2), 61–69.
- Milenia, N. (2022). Pengaruh Posisi Duduk Terhadap Keluhan Low Back Pain Pada Mahasiswa Universitas Yarsi Angkatan 2018. *JIMKI: Jurnal Ilmiah Mahasiswa Kedokteran Indonesia*, 10(1), 11–21.
- Moffroid, M., Reid, S., Henry, S. M., Haugh, L. D., & Ricamoto, A. (1994). Some endurance measures in persons with chronic low back pain. *Journal of Orthopaedic & Sports Physical Therapy*, 20(2), 81–87.
- Park, W. H., Kim, J. I., Kim, S. H., & Kwon, S. B. (2018). The effects of posture on low back pain during computer work: A systematic review. *International Journal of Industrial Ergonomics*, 68, 170–181.
- Peterson, N. E., Sirard, J. R., Kulbok, P. A., DeBoer, M. D., & Erickson, J. M. (2015). Validation of accelerometer thresholds and inclinometry for measurement of sedentary behavior in young adult university students. *Research in Nursing & Health*, 38(6), 492–499.
- Pillai, D., & Haral, P. (2018). Prevalence of low back pain in sitting vs standing postures in working professionals in the age group of 30-60. *International Journal of Health Sciences & Research*, 8(10), 131–137.
- Pratami, A. R., Zulhamidah, Y., & Widayanti, E. (2019). Hubungan Antara Sikap Duduk dengan Kejadian Low Back Pain pada Mahasiswa Fakultas Kedokteran Universitas YARSI Tahun Pertama dan Tahun Kedua. *Majalah Kesehatan Pharmamedika*, 11(2).
- Puolakka, T., Kaartinen, S., & Hupli, M. (2020). Association between sedentary behavior and low back pain: A systematic review. *Physical Therapy Reviews*, 25(1), 33–43.
- Purwata, T. E., Sadeli, H. A., Yuneldi, Y., Amir, D., Asnawi, C., Dani, S., & Mangara, Y. (2015). Characteristics of neuropathic pain in Indonesia: A hospital based national clinical survey. *Neurology Asia*, 20(4).

- Puti, C., & Rosady, D. S. (2022). Hubungan antara posisi duduk dengan keluhan punggung bawah pada mahasiswa Fakultas Kedokteran selama study from home. *Bandung Conference Series: Medical Science*, 2(1), 1139–1144.
- Rahmawati, A. (2021). Risk factor of low back pain. *Jurnal Medika Hutama*, 3(01 Oktober), 1601–1607.
- Safira, H., Emiralda, E., & Atika, R. A. (2023). Hubungan Durasi Duduk Dengan Kejadian Low Back Pain (LBP) Pada Mahasiswa Fakultas Kedokteran Universitas Abulyatama. *Jurnal Ilmu Kedokteran dan Kesehatan*, 10(11), 3351–3357.
- Saiklang, P., Puntumetakul, R., Swangnetr Neubert, M., & Boucaut, R. (2021). The immediate effect of the abdominal drawing-in maneuver technique on stature change in seated sedentary workers with chronic low back pain. *Ergonomics*, 64(1), 55–68.
- Smith, A., O’Sullivan, P., Straker, L., & Perry, M. (2019). Increasing the duration of classroom-based physical activity breaks in primary schools has a positive impact on low back pain in teachers. *European Journal of Pain*, 23(4), 730–739.
- Stuart, G. W. (2012). *Principles and Practice of Psychiatric Nursing-E-Book: Principles and Practice of Psychiatric Nursing-E-Book*. Elsevier Health Sciences.
- Taha, Y. A., Al Swaidan, H. A., Alyami, H. S., Alwadany, M. M., Al-Swaidan, M. H., Alabbas, Y. H., & Faidhi, A. A. (2023). The prevalence of low back pain among medical students: a cross-sectional study from Saudi Arabia. *Cureus*, 15(5).
- Tamrakar, M., Kharel, P., Traeger, A., Maher, C., O’Keeffe, M., & Ferreira, G. (2021). Completeness and quality of low back pain prevalence data in the Global Burden of Disease Study 2017. *BMJ Global Health*, 6(5), 5847.
- Tifani, A., Setiawan, M. R., & Faizin, C. (2023). Hubungan Posisi Duduk, Durasi Duduk, Dan Jenis Tempat Duduk Terhadap Keluhan Low Back Pain (Lbp) Saat Kuliah Online Pada Mahasiswa Fakultas Kedokteran. *Jurnal Ilmu Kedokteran dan Kesehatan*, 10(10), 2901–2908.
- Todd, A. I., Bennett, A. I., & Christie, C. J. (2007). Physical implications of prolonged sitting in a confined posture-a literature review. *Ergonomics SA: Journal of the Ergonomics Society of South Africa*, 19(2), 7–21.
- Wardaningsih, I. (2010). *Pengaruh sikap kerja duduk pada kursi kerja yang tidak ergonomic terhadap keluhan otot-otot skeletal bagi pekerja wanita bagian mesin cucuk di PT Iskandar Indah Printing Textile Surakarta*.
- W.H.O. (2023). *Low back pain [WWW Document]*. <https://www.who.int/news-room/fact-sheets/detail/low-back-pain>.
- Zaccagnini, M., & Pechacek, J. M. (2019). *The doctor of nursing practice essentials: A new model for advanced practice nursing*.