Prevalence of Musculoskeletal Pain and Level of Postural Awareness Among Varsity Students

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ABSTRACT

Musculoskeletal pain is a common subject of numerous studies worldwide, encompassing various populations, including university students. However, the extent of musculoskeletal pain (MSP) among university students in Malaysia remains understudied. Therefore, the main objective of this study is to determine the pattern of musculoskeletal pain among university students. A cross-sectional study was conducted among university students using an online survey. The participants were university students who volunteered and completed a structured questionnaire on MSP in the past 7 days and 12 months, as well as questionnaires on postural awareness using the Nordic Musculoskeletal Questionnaire (NMQ) and the Postural Awareness Scale Questionnaire (PAS). A total of 110 public university students, with an average age of 22.38 (1.27) years and a BMI of 23.32 (4.45) kg/cm2, participated in the study, with 43.60% being male and 56.40% female. The total PAS score was 49.46 (8.91). The prevalence of body pain was highest in the lower back and shoulders, in both the 12 months and the last 7 days. Female students reported more cases of musculoskeletal pain compared to male students, and the pattern of pain differed between genders. The PAS score showed a significant correlation with neck ($r = 0.24$, $p = 0.01$), upper back ($r = 0.21$, $p = 0.02$) (12 months), and ankle/feet ($r = 0.10$, $p = 0.04$) (last 7 days) pain. The present study indicated a weak correlation between PAS and the prevalence of MSP. Further large-scale studies are needed to investigate other contributing risk factors of MSP among university students.

Keywords: Risk factor, Musculoskeletal Pain, Postural Awarenes, University students

INTRODUCTION

Musculoskeletal pain considered as a global health concern and if not treated early it can lead to chronic pain that resulting the disability and affecting the work performance (Watson et al., 2019). Musculoskeletal pain, which affects the bones, joints, muscles, tendons and ligaments of the human body (Korhan & Memon, 2019), is one of the most common types of pain which can be either acute or chronic. This musculoskeletal pain is highly related to working environment where inadequacy of physical capacity of the human body in relation to task requirement. The musculoskeletal pain may result from repetitive motion, forces, vibration on human body, previous injury, physical condition, hereditary, lifestyle, poor diet (Korhan & Memon, 2019). This musculoskeletal pain experienced not only by working adults but also among university students because their daily tasks include an active lifestyle (Abadi et al., 2022). The repetitive use of upper limbs during activities, coupled with sustained postures during writing, infrequent breaks, and the pressures from academic and personal life, may lead to continuous muscle activation (Wohlmuth-Cohen & Leon- Avila (2021).

Literature has mentioned the duration hour exposure to a risk factor which requires similar motion for long period causes general and local fatigue (Korhan & Memon, 2019). As mention in Parry et al (2018) found that most of students often spend more 6 to 8 hours per day sitting in class or working at the front of a computer. In the last ten years, sedentary behaviours have become more prevalent, with individuals spending greater periods seated—for instance, in educational settings, during commutes, or while using computers—compared to engaging in activities that require more energy expenditure (Wohlmuth-Cohen & Leon- Avila (2021). It was observed that the student experiencing musculoskeletal pain in the neck, shoulder, elbow and lower back, and when the posture change from sitting to standing desk in classroom, it increases standing time and reduce the incidence of reported body pain (Parry et al., 2018).The incidence of musculoskeletal discomfort, including pain in the neck, shoulders, and lower back, has been increasingly observed in university students over the years. The most frequently affected areas are the neck, lower back, shoulders, and limbs (Almhdawi, Mathiowetz, Al-Hourani et al., 2017; Anggiat et al., 2018). Such symptoms are particularly prevalent among female and older university students (Almhdawi et al., 2017; Tantawy, Rahman, & Ameer, 2017; Anggiat et al., 2018). Despite the growing recognition of musculoskeletal pain as a major contributor to disability globally (Hoy, March, Brooks, et al., 2014; Hoy, March, Woolf, et al., 2014), the link between MSP and postural awareness (PA) in university students remains underexplored. Postural awareness, as defined by Cramer et al. (2018), refers to an individual's subjective perception of their own body posture, largely informed by proprioceptive feedback to the central nervous system. The American Academy of Orthopaedic Surgeons characterizes poor posture as an improper alignment of body parts that augments strain on bodily support structures, potentially leading to disability, pain, or discomfort.

Numerous investigations have primarily concentrated on healthcare students when studying musculoskeletal pain and postural awareness (PA). Cramer et al., 2018; Anggiat et al., 2018). To our knowledge, there is a scarcity of research exploring the patterns of MSP and its association with PA in students from public universities. Therefore, the aim of the present study is to explore the patterns of MSP and their relationship with PA among students at public universities.

METHODOLOGY

Study Design

This study utilized a cross-sectional survey design involving university students to determine the pattern of musculoskeletal pain among selected participants and its association with postural awareness. Ethical approval was sought and obtained from the university research ethics committee.

Participant

The study population included public university students. The sampling technique used was probability sampling, specifically simple random sampling. The population size for this study is 20,000. According to Krejcie & Morgan (1970), the sample size for this population is 377. However, only a total of 110 students participated in the survey, resulting in an attrition rate of about 70%. The inclusion criteria were pre-set as follows: (i) male or female currently studying in a public university, (ii) aged 18-26 years old, (iii) possessing a Diploma or Undergraduate Degree, and (iv) having owned and used a laptop for at least 6 months prior to the study. The exclusion criteria were: (i) students with poor English proficiency (MUET Band 2 or below), (ii) those who do not possess a computer or tablet, and (iii) those who do not have access to the internet. Prior to data collection, each participant signed the consent form.

Data Collection

The set of questionnaire in this study consists of 3 parts which is demographic, Nordic Musculoskeletal Questionnaire (NMQ) (Kourinka et al., 1987), and Postural Awareness Scale (PAS) questionnaire. The demographic section consists of age, gender, height, and weight and matric number. The Nordic Musculoskeletal Questionnaire (NMQ) was utilized to evaluate the symptoms of musculoskeletal pain while the Postural Awareness Scale (PAS) was used to measure the level of postural awareness among the students. In research with a large number of participants, the NMQ can be used for the screening of musculoskeletal problems and allows for the comparison of MPS in various body regions. The survey is freely accessible and in the public domain. This is a valid tool for evaluating MPS in the neck, shoulders, elbows, wrist, hands, upper and lower back, and hips, knees, ankles, and feet. The participants reported whether they had MPS in the previous week (7 days) or the previous year (12 months). There were two options of answer, yes or no. They also reported if they had daily life activity limitations due to their MPS.

Postural awareness scale (PAS) test was developed to evaluate an individual's level of self-reported body posture awareness. The PAS questionnaire contained 13 questions. The item's responses are graded using a 7-point Likert scale. The scale goes from 1 (not at all true about me) to 7 (very true about me). Six items are reversely scored (item 1, 2, 4, 5, 6, 13), so that higher score values consistently indicate higher postural awareness. In terms of the summary score, it runs from 13 to 91. The higher score values regularly show a stronger awareness of one's posture.

The questionnaires were distributed among the university students using an online platform. Subjects will be asked to fill out a set of questionnaires through the Google Form link. In the first part, the participants were giving their consent to participate in this study. The demographic data were collected from the participants in the second part that have given their consent to participate in this study previously. The participants then asked to fill another 2 parts in the questionnaires which is Nordic Musculoskeletal Questionnaire (part 1) and Postural Awareness Scale (PAS) Questionnaire (part 2). The total estimated time to answer this questionnaire average less than 5 minutes. Each participant was then given a copy of the questionnaire and it was retrieved immediately after providing answers to all the questions in the questionnaire. The raw data then were exported into Microsoft Excel for data clearance and scoring calculation. Later, final raw date exported to SPPS for further analysis.

Data Analysis

The data analysis for this study be using IBM SPSS Statistics for Windows version 26.0 software program. Data from the survey were examined and recorded into a research data form. The descriptive (mean, SD) were used to analyse the pattern of musculoskeletal pain according to body region and between genders (male, female) and the cross tabulation analysis were used to evaluate the correlation between musculoskeletal pain and postural awareness with statistical significance at $p < 0.05$ (two-tailed).

RESULT AND DISCUSSION

Demographic Data

A total of 110 university students participated in this study consisting of $n = 48$ (43.60%) male and $n = 62$ (56.40%) female students (Table 1).

Table 1. Participant Demographic (n = 110)

Variables	Mean (SD)
Age (years)	22.38 (1.28)
Body Mass Index (Overall) (BMI) Kg/m^2	23.32 (4.46)
Male (BMI) Kg/m^2	22.42 (1.51)
Female (BMI) Kg/m^2	22.35 (1.07)
PAS Score	49.46 (8.91)

Notes: PAS = Postural Awareness scale

Prevalence of Musculoskeletal Pain (MSP) according to Body Region

Table 2 shows the percentage of musculoskeletal pain among the public university students in various body regions in both time frames. Lower back (46.4%) followed by shoulders, neck and upper back are the most frequently reported region for MS pain in the last 12 months. Meanwhile in the last 7 days, lower back (33.6%) followed by shoulders, upper back and neck are the most frequently reported region for MS pain.

Table 2. Musculoskeletal pain prevalence among public university students in the last 12 months and 7 days

Body Region	Occurrence in last 12 months n (%)	Occurrence in last 7 days n (%)
Neck	42 (38.2%)	21 (19.1%)
Shoulder(s)	45 (40.9%)	36 (32.7%)
Elbow(s)	12 (10.9%)	7 (6.4%)
Wrist(s)/hand(s)	21 (19.1%)	12 (10.9%)
Upper back	29 (26.4%)	24 (21.8%)
Lower back	51 (46.4%)	37 (33.6%)
Hip(s)/thigh(s)	7 (6.4%)	5 (4.5%)
Knee(s)	24 (21.8%)	17 (15.5%)
Ankle(s)/feet	22 (20.0%)	18 (16.4%)

Prevalence of Musculoskeletal Pain According to Gender

Table 3 shows the prevalence of MS pain in the past year and past week according to gender. The table shows the most frequently reported MS pain area in male public university students in the last 12 months was lower back (43.8%), followed by neck and shoulders. Female students reported highest MS pain on shoulders (53.2%), followed by lower back and neck. Meanwhile, the highest reported percentage of MS pain occurrence in the last 7 days in female students was lower back (46.8%) and followed by shoulders and upper back. Male students reported highest occurrence of pain on shoulders (25.0%) followed by neck and upper back. As can be seen from Table 3, female students reported more cases of MS pain compared to the male students in most body region.

Table 3. Musculoskeletal pain prevalence among public university students in the last 12 months and 7 days according to gender

Gender	Male		Female	
Body Region	**12 months** *n* **(%)**	**7 days** *n* **(%)**	**12 months** *n* **(%)**	**7 days** *n* **(%)**
Neck	15 (31.3%)	9 (18.8%)	27 (43.5%)	12 (19.4%)
Shoulder(s)	12 (25.0%)	12 (25.0%)	33 (53.2%)	24 (38.7%)
Elbow(s)	5 (10.4%)	4 (8.3%)	7 (11.3%)	3 (4.8%)
Wrist(s)/hand(s)	10 (20.8%)	7 (14.6%)	11 (17.7%)	5 (8.1%)
Upper back	11 (22.9%)	9 (18.8%)	18 (29.3%)	15 (24.2%)
Lower back	21 (43.8%)	8 (16.7%)	30 (48.4%)	29 (46.8%)

Postural Awareness and Musculoskeletal Pain

Table 4 and Table 5 show the association between postural awareness and musculoskeletal (MS) pain in 7 days and 12 months among the students. In 7 days, ankle/feet region has revealed a significant data which is $p < 0.05$ but negative correlation ($r = -0.190$) However, in 12 months, both neck and upper back region has shown a significant data with $p < 0.05$ but weak correlation ($r = 0.244$; $r = 0.208$ respectively) with PASS Score.

Table 4. Association between postural awareness and MS pain among public university students in 12 months

PAS Score	Pearson Correlation	Sig. (2-tailed)	N
	1	-	110
Neck	*0.244**	**0.010**	110
Shoulder(s)	0.091	0.342	110
Elbow(s)	0.146	0.127	110
Wrist(s)/hand(s)	0.096	0.320	110
Upper back	*0.208**	**0.029**	110
Lower back	0.131	0.173	110
Hip(s)/thigh(s)	- 0.062	0.520	110
Knee(s)	- 0.087	0.369	110
Ankle(s)/feet	-0.094	0.327	110

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

Table 5. Association between postural awareness and MS pain
among public university students in 7 days

	Pearson Correlation	**Sig. (2-tailed)**	**N**
PAS Score	1	-	110
Neck	-0.019	0.844	110
Shoulder(s)	0.093	0.333	110
Elbow(s)	-0.009	0.925	110
Wrist(s)/hand(s)	0.031	0.744	110
Upper back	0.152	0.114	110
Lower back	0.122	0.205	110
Hip(s)/thigh(s)	-0.043	0.658	110
Knee(s)	-0.102	0.287	110
Ankle(s)/feet	*-0.190**	*0.047*	*110*

The purpose of this study was to investigate the pattern of musculoskeletal pain and to determine the relationship of postural awareness with the reported pain among university students. In overall, university student reported of having lower back (46%), shoulder (40%) and neck pain (38%) occurrence in last 12 months. This pattern is almost similar in musculoskeletal pain reported in last 7 days involving lower back, shoulder and upper back (33%, 32% and 22%) respectively. Female university student reported a higher musculoskeletal pain than male counterpart with slight differences in musculoskeletal pain pattern. Female university student reported highest MS pain on shoulders (53.2%), followed by lower back and neck. However, the male student reported of experience lower back (43.8%), followed by neck and shoulders pain in past 12 months. The higher prevalence of musculoskeletal pain among the female can be attributed to the comparatively smaller body frame and reduced muscle tone of females (Khan & Yee Chew, 2013), higher academic achievement, higher stress level and physically less active compared to their male counterpart. Another possible explanation regarding the higher musculoskeletal pain among female maybe due to involvement of menstrual cycles that play a vital role in in explaining the variation in pain sensitivity between genders (Felemban et al., 2021). However, the male counterpart who physical active more than female may have higher incidence of injury and increase the risk of musculoskeletal pain (Abadi et al., 2022). Therefore, once should be cautious when interpreting the cause of musculoskeletal pain with or without the involvement of physical activities (Busing & West, 2016).

In our study, the commonest musculoskeletal pain reported by university student was low back pain. The low back pain is considered as the cause of long term cause of disability worldwide and have reported global point of prevalence of 9.4% (Hoy, March, Brooks, et al., 2014, Wu et al., 2020). The recent studies by Wu et al. (2014) was reported the prevalent numbers of people with LBP increased significantly from 377.5 million (1997) to 577.0 million in 2017. Interestingly, it was observed that the age-standardized prevalence of low back pain exhibited a higher occurrence among females compared to males. The gender disparity in reported low back pain may be attributed to a multifaceted interaction of biological, psychological, and sociocultural factors (Wu et al., 2014). Studies have suggested that the act of carrying heavy college bags during travel and prolonged standing can exert strain on both the back and neck, consequently contributing to poor posture among university students (Hassan, Yaqoob, Ali & Siddiqui, 2018).

Moreover, the findings of this investigation unveiled neck pain as a prevalent musculoskeletal complaint among university students, corroborating prior research outcomes (Hoy March, Woolf, et al., 2014). According to the research conducted by Hoy et al. (2014), neck pain was classified into four categories: (1) Acute severe neck pain; (2) Acute mild neck pain; (3) Chronic severe neck pain; and (4) Chronic mild neck pain. Current study unable to describe further on severity of neck pain among university study and thus it will not further discuss. The occurrence of neck pain may be associated with job that are monotonous task, prolonged static posture, work that involving heavy lifting, vibration, repetitive and high pace with female

are at greater risk compared to male counterpart (Kim, Boo, Meeker, 2021, Abadi et al., 2022). Prolonged work on computer and desktop for their work, more sitting time, studying on bed and poor posture has been identified among the factors contributing to the development of neck pain among university students (Hassan, Yaqoob, Ali & Siddiqui, 2018).

Although university students considered young and active, but they may have a higher than average risk of getting MS pain. In this study, the university students reported highest incidence rate of pain on lower back, shoulder, neck and upper back in the last 12 months and 7 days. Previous studies also indicated a similar pattern of MS pain among university students. Regiani et al. (2019), came to the conclusion that some smartphone-related behaviour can cause MS pain. The majority of university students who reported having MS pain also said they frequently flexed their necks, shoulders, upper backs, and lower backs while using smartphones (Namwongsa et al, 2018). Legan, M., & Zupan, K. (2022).stated that excessive use of computer or tablet can negatively influence physical health by limiting the amount of daily exercise. Exercise and the prevalence of MS pain were significantly correlated, and those who exercised frequently reported having experienced less of MS pain (Hashim et al, 2021). Hasan et al (2018) found that majority of university students with MS pain had never consulted by a doctor or physiotherapist for their pain. Therefore, the occurrence and severity of MS pain probably underestimated and possible a higher rate of incidence of MS pain within this population. Continuous and a large scale research on this area involving more number of respondent may help to us to distinguish the severity of MS pain among this population

Our finding has revealed that male students are prone to have MS pain in lower back and this finding also similar with recent study by Anggiat et al. (2018) which stated that higher incidence of low back pain in his study is due to the long hours of sitting which is more than 3 hours a day among the students. Prolonged static muscle contraction, increased stress on the intervertebral discs, and tension on ligaments and muscles may all be caused by prolonged sitting. Smoking also found to significantly increase low back pain, which was found to be a factor that increased low back pain in university students (Lotfi et al, 2016). 60% of male university students smoke according to a Malaysian research. Smoking is known to reduce bone mineral density, and osteoporosis may follow this reduction, allowing for the formation of micro fractures in the vertebrae. In addition, female students have reported higher MS pain on the shoulder region. According to Mowatt et al. (2017), their research revealed that female students were more likely than male to experience shoulder pain and this may be associated with shorter stature affecting their arms, wrists and reach which may affect the reading distance from a hand-held computer or their height on a desk mounted computer requiring them to have a chin up position, increasing musculoskeletal symptoms.

The findings in this study also observed a higher percentage of musculoskeletal pain occurrence among female students compared to the male students in most parts of the body region. Females may be more sensitive to pain and hence likely to complain of it more frequently, whereas males tend to under-report musculoskeletal pain and seek less medical attention than females do. Due to the differences in musculoskeletal structure for both genders which is females are smaller, compressive fibres and muscle tone, functional abilities, and menstruation cycles, females were more at risk of musculoskeletal pain than males (Busing & West, 2016).

Enhanced postural awareness is believed to be inversely correlated with the prevalence of musculoskeletal pain, suggesting that individuals with better posture may experience reduced instances of such discomfort (Cramer, Mehling, Saha, Dobos, & Lauche, 2018). This study also found a positive significant but weak correlation between postural awareness (PA) and musculoskeletal (MS) pain. This may be indicating that postural awareness alone was not a strong factor for MS pain occurrence and there are many other factors that are more relevant to this issue. Various risk factors are associated with musculoskeletal pain among university students. These include Body Mass Index (BMI), participation in sports, advancing age, inadequate sleep duration, mental health, and a history of previous musculoskeletal injuries (Fulton, Wright, Kelly, Zebrosky, Zanis, Drvol & Butler et al., 2014). University students are often engaged in various physical activities and may have a history of sports-related injuries. Previous research

has shown a notable correlation between prior injuries and reported musculoskeletal pain among this demographic. This association could be linked to the identification of past injuries as a key risk factor for subsequent ones, influenced by changes in the kinematic chain, including proprioceptive deficits and alterations in movement patterns (Fulton et al., 2014). According to a study by Owoeye et al. (2022), it is likely that the healing process was impaired in subjects who perceived their prior injury had not fully healed and this explain the potential process by which a past injury is connected to a new occurrence. Although PA is not a main contributing factor in MS pain, but as in preventative action, education and awareness on a good posture education (Valenciano, Cibinello, Neves, & Fujisawa, 2020) will help in reduce the risk of MS pain. Although gender plays a significant role in determining the pattern of musculoskeletal pain among university students, this study did not delve into further exploration regarding how gender influences both the Postural Awareness Scale (PAS) score and the experience of musculoskeletal pain, as it was beyond the scope of the study.

Miaza et al. (2020) discovered in their study that physical inactivity was an independent factor positively correlated with musculoskeletal pain. Sedentary lifestyles may lead to weakened muscles, while regular exercise can strengthen them over time, enhancing their capacity to endure the strain of demanding activities and alleviate discomfort associated with repetitive motions. Forward head posture, commonly observed among university students, correlates with the rolling forward of the shoulder region and has been associated with musculoskeletal issues, particularly neck pain, as reported by Naz A et al. (2018). Other factors contributing to musculoskeletal pain include caffeine consumption, stress, and the use of backpacks, as indicated by previous studies. However, limitations prevented further discussion on this topic. Future studies are recommended to include information on the level of physical activity, sleep quality, history of previous injury, and hours of computer or tablet use.

Several preventative strategies for musculoskeletal pain among university students have been proposed in previous literature (Santosi, Popalwar & Pakhare, 2019; Kim, Boo, & Meeker, 2021; Legan & Zupan, 2022). These strategies include educating students on proper ergonomic practices and fostering good posture habits while working at a desk, as well as improving the physical fitness levels of both male and female students. Furthermore, it is crucial that university students experiencing persistent and severe pain in multiple body areas receive timely and effective care to prevent potential long-term consequences (Kim, Boo, &Meeker, 2021), such as disability and mental health issues, thereby ensuring their overall well-being and academic success.

The study's findings are constrained by several limitations. Firstly, the reliance on self-reported questionnaires introduces potential biases due to participants' subjectivity and recall inaccuracies. Moreover, the study sample primarily consisted of individuals with an average normal BMI, potentially limiting the generalizability of the results to other BMI categories. Additionally, the unequal gender distribution among participants may skew the findings, warranting caution in extrapolating conclusions to both genders equally. Furthermore, the study did not incorporate several crucial factors, such as the duration of the study, participants' physical activity levels, psychological measures, sleep patterns, and previous injury history. Future research endeavors should account for these variables to provide a comprehensive understanding of the topic. Lastly, the study's data were collected solely from a single institution, limiting the broader applicability of the findings to all university students in Malaysia. Therefore, caution should be exercised when generalizing the results beyond the specific context of the study site.

CONCLUSION

The study has concluded that the prevalence of musculoskeletal pain among public university students is seriously concerning, particularly among female students. The notably high prevalence of musculoskeletal pain, predominantly in the lower back, shoulder, neck, and upper back regions, is worrying and underscores the necessity for preventive strategies within this population. A continuous monitoring of musculoskeletal pain is the initial step in preventing, diagnosing, and treating these issues is understanding

the frequency, patterns, and risk factors of musculoskeletal pain. Therefore, further studies should be conducted to investigate the contributing factors of musculoskeletal pain among university students. It is recommended that future research endeavors aim to identify additional risk factors associated with musculoskeletal pain among students. More extensive studies are warranted among large samples representing both male and female university students in Malaysia for comprehensive investigations. The inclusion of multiple institutions with larger samples is necessary to comprehend the prevalence and severity of musculoskeletal pain among university students for long-term health monitoring. Universities are also encouraged to increase awareness regarding musculoskeletal pain among their students and implement preventative measures such as postural education and good practice ergonomic for student to reduce the rate of reported cases of musculoskeletal pain.

AUTHORS' CONTRIBUTION

Conceptualization – Fairus Fariza Zainudin, Siti Nur Fatimah Abdullah
Methodology – Fairus Fariza Zainudin, Siti Nur Fatimah Abdullah, Fariba Hossein Abadi, Mohansundar Sankaravel
Analysis – Siti Nur Fatimah Abdullah, Fairus Fariza Zainudin
Writing – Fairus Fariza Zainudin, Siti Nur Fatimah Abdullah
Submission – Fairus Fariza Zainudin

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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