



Research article

Prevalence and Ergonomic Risk Factors of Work-related Musculoskeletal Disorders among Health Sciences Students in Puncak Alam, Selangor

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Abstract

Work-related musculoskeletal disorders (WMSDs) are a leading occupational health concern, increasingly affecting student populations engaged in prolonged sedentary and study-related activities. This study aimed to determine the prevalence of WMSDs among undergraduate students at the Faculty of Health Sciences, Universiti Teknologi MARA (UiTM), Puncak Alam, Selangor, and to evaluate ergonomic risks associated with study postures. A cross-sectional study was conducted among 116 students from eight health science programmes, selected using simple random sampling. Data were collected using a self-administered questionnaire incorporating sociodemographic variables and the Standardized Nordic Musculoskeletal Questionnaire (SNQ), while ergonomic risks were assessed via direct observation with the Rapid Upper Limb Assessment (RULA) tool. Statistical analysis was performed using SPSS version 28, with significance set at $p \leq 0.05$. Results indicated that the most common musculoskeletal complaints within the past 12 months were neck (62.1%), upper back (60.3%), lower back (59.5%), and shoulder pain (58.6%). Wrist/hand discomfort was reported by 49.1% of participants. RULA assessment showed that 85.3% of students scored 3–4, indicating medium ergonomic risk requiring further investigation, while 14.7% scored 5–6, suggesting corrective measures are needed. No significant association was found between MSD symptoms and RULA scores. The findings highlight the considerable burden of WMSDs among health sciences students and underscore the importance of ergonomic awareness, improved study environments, and preventive strategies. Future longitudinal studies are recommended to establish causal relationships.

Keywords: Musculoskeletal disorders, students, ergonomics, RULA, prevalence

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INTRODUCTION

Musculoskeletal disorders (MSDs) are injuries or conditions affecting the muscles, tendons, ligaments, joints, nerves, and supporting structures of the body. Globally, MSDs are recognized as one of the most common occupational health concerns, with the World Health Organization estimating that approximately 1.71 billion people are affected, making them a leading cause of disability worldwide (WHO, 2021). Among these, low back pain remains the most prevalent, contributing substantially to reduced quality of life, productivity loss, and long-

term disability. Traditionally, MSDs have been studied in industrial and occupational contexts where physical workload, repetitive tasks, and awkward postures drive risk. However, emerging evidence highlights that university students, particularly those in health sciences, are increasingly vulnerable due to prolonged sedentary activities and study-related demands.

The transition to digital-based learning, intensified during and after the COVID-19 pandemic, has magnified sedentary behaviour and screen exposure among students. Health

sciences undergraduates spend extensive hours attending lectures, engaging in laboratory sessions, and completing computer-based assignments—often in non-ergonomic environments such as dormitories or shared study areas. These prolonged exposures to static postures, neck flexion, and awkward arm positions have been strongly linked to musculoskeletal discomfort in the neck, shoulders, and lower back (Mowatt et al., 2017; Roggio et al., 2021). Such early-onset MSD symptoms are particularly concerning, as they may compromise academic performance in the short term and predispose students to chronic musculoskeletal problems later in their professional careers.

International studies consistently report high MSD prevalence among student populations. For instance, Hendi et al. (2021) found substantial neck and back complaints among medical students in Saudi Arabia, attributing symptoms to sedentary learning and academic stress. Similarly, Senarath et al. (2021) reported that 73.6% of allied health students experienced musculoskeletal pain, with neck symptoms most common. In the context of the COVID-19 pandemic, Karingada and Sony (2021) documented that over 80% of students reported new or aggravated head, eye, and neck problems during prolonged online learning, while Roggio et al. (2021) observed increased low back pain among Italian undergraduates due to heightened sedentary time. Collectively, these findings suggest that the university environment itself can mirror workplace risk exposures, with implications for long-term musculoskeletal health.

Beyond prevalence data, validated tools to measure both symptoms and ergonomic risk are essential in advancing research. The Standardized Nordic Musculoskeletal Questionnaire (SNQ), developed by Kuorinka et al. (1987), remains a gold standard for symptom surveillance and has been widely applied in cross-cultural contexts, including healthcare students. For assessing postural and biomechanical risk, the Rapid Upper Limb Assessment (RULA) provides a structured observational method for scoring trunk, neck, and upper limb postures, yielding action levels that guide whether corrective intervention is required (McAtamney & Corlett, 1993). Several studies have combined SNQ and RULA to capture both self-reported musculoskeletal complaints and observed ergonomic exposures, providing a holistic view of risk (Golchha et al., 2014; Devi et al., 2017).

However, the literature also reveals inconsistencies. While some studies demonstrate significant associations between RULA scores and MSD symptoms, others report non-significant findings, suggesting that symptom expression is influenced by multifactorial determinants such as exposure duration, psychosocial stress, and individual susceptibility (Ismail et al., 2009; Morais et al., 2019). Gender and body mass index (BMI) have emerged as notable correlates: females and students with higher BMI are often at greater risk of musculoskeletal complaints, a trend echoed in both student and occupational cohorts (Peng et al., 2021; Hendi et al., 2019). Additionally, device-specific behaviors—such as prolonged smartphone use with sustained neck flexion—have been implicated in elevated MSD risk (Gustafsson et al., 2017). These findings underscore the importance of analyzing demographic and behavioral factors alongside ergonomic assessments to generate meaningful insights.

Despite robust international evidence, research on MSDs among Malaysian university students remains limited. Most local studies have focused on healthcare professionals or workers in industrial sectors, leaving a gap in understanding the musculoskeletal health of students, particularly those in health sciences who represent the future workforce in physically demanding healthcare roles. Addressing this gap is critical, as preventive strategies implemented during student years may reduce the likelihood of long-term musculoskeletal complications in professional practice.

METHODOLOGY

Study Design and Setting

A cross-sectional study was conducted at Universiti Teknologi MARA (UiTM), Selangor, Puncak Alam Campus, to determine the prevalence of musculoskeletal disorders (MSDs) and assess ergonomic risks among undergraduate students of the Faculty of Health Sciences.

Population and Sampling

The study population comprised students from eight programmes: Nursing, Physiotherapy, Nutrition and Dietetics, Environmental Health and Safety, Medical Imaging, Optometry, Medical Laboratory Technology, and Occupational Therapy. Using the Raosoft sample size calculator, 116 participants were determined from an estimated population of 500, based on a 95% confidence level and 8% margin of error. Simple random sampling was applied. Eligible participants were full-time second- to fourth-year students residing on campus and able to understand English. Students in part-time or distance-learning programmes, those undergoing clinical or industrial training, and those unwilling to provide consent were excluded.

Instruments

Data were collected using a self-administered questionnaire and ergonomic observation. The questionnaire included sociodemographic items and a modified Standardized Nordic Musculoskeletal Questionnaire (SNQ) (Kuorinka et al., 1987) to record musculoskeletal pain or discomfort across body regions in the past 7 days and 12 months, as well as its interference with daily activities. Ergonomic risks were assessed using the Rapid Upper Limb Assessment (RULA) tool, which evaluates posture, muscle use, and force exertion to determine risk levels and need for corrective measures. Observations were conducted while students engaged in typical study tasks.

Data Collection and Analysis

Participants provided written informed consent after being briefed on the study purpose and their rights. Only completed questionnaires were included in the analysis. Data were analysed using IBM SPSS Statistics. Descriptive statistics (means, standard deviations, frequencies, percentages) summarised sociodemographic characteristics, MSD prevalence, and ergonomic risk levels. Associations between MSDs and ergonomic risk scores were examined using the Chi-square test, with significance set at $p \leq 0.05$.

RESULTS AND DISCUSSION

Socio-demographic Characteristics

A total of 116 undergraduate students from the Faculty of Health Sciences, UiTM Puncak Alam, participated in this study. The majority were female (79.3%), while male students accounted for 20.7%. The mean age of participants was 21.69 years ($SD = 1.22$). The mean BMI was 23.11 ($SD = 3.76$), with most students (62.1%) falling within the normal BMI range (18.5–24.9 kg/m^2). A smaller proportion were underweight (8.6%), overweight (24.1%), or obese (5.2%). In terms of academic level, 44.8% of respondents were in their second year, 43.1% in their third year, and 12.1% in their fourth year. Students were drawn from eight programmes, with the largest representation from Occupational Therapy (16.4%), followed by Nursing and Medical Laboratory Technology (14.7% each). Detailed socio-demographic data are presented in Table 1.

Table 1. Socio-demographic characteristics of respondents.

Variables	Mean (SD)	n (%)
Age	21.69 (1.22)	
Gender		
Male		24 (20.7)
Female		92 (79.3)
BMI (kg/m^3)	23.11 (3.76)	
Underweight		10 (8.6)
Normal		72 (62.1)
Overweight		28 (24.1)

Variables	Mean (SD)	n (%)
Obese		6 (5.2)
Year of study		
2nd Year		52 (44.8)
3rd Year		50 (43.1)
4th Year		14 (12.1)
Programme of study		
Nursing		17 (14.7)
Optometry		16 (13.8)
Physiotherapy		12 (10.3)
Nutrition and Dietetics		9 (7.8)
Environmental Health and Safety		10 (8.6)
Medical Imaging		16 (13.8)
Medical Laboratory Technology		17 (14.7)
Occupational Therapy		19 (16.4)

Prevalence of Work-related Musculoskeletal Disorders (WMSDs)

The most frequently reported symptoms within the past 12 months were neck pain (62.1%), upper back pain (60.3%), and lower back pain (59.5%). Shoulder discomfort was also highly prevalent (58.6%), followed by wrist/hand pain (49.1%). Lower extremity complaints were less common, with knee (18.1%) and ankle/foot discomfort (14.7%) reported by fewer students.

Within the previous seven days, shoulder pain (37.9%), neck pain (36.2%), and upper back pain (35.3%) were the most common complaints. These symptoms also interfered with daily activities, particularly pain in the shoulders (48.3%), neck (42.2%), and lower back (36.2%) (Figure 2).

These findings are consistent with previous studies that reported neck and shoulder pain as highly prevalent among health sciences and medical students (Hendi et al., 2021; Senarath et al., 2021). Factors such as prolonged sitting, awkward posture, repetitive movements, and intensive use of computers and mobile devices likely contribute to these outcomes (De Vitta et al., 2020; Weleslassie et al., 2020).

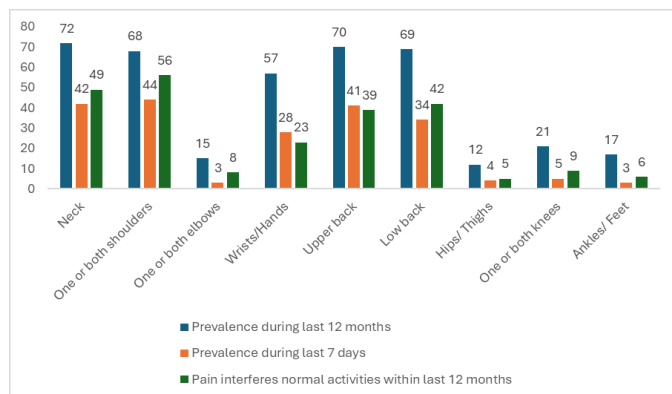


Figure 1. Prevalence of WMSDs in different body regions

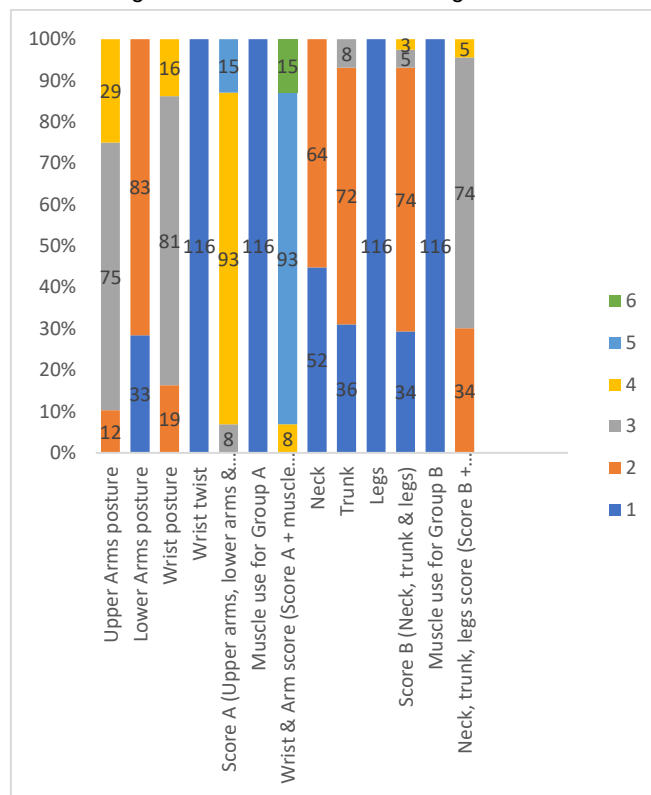
Ergonomic Risk Assessment (RULA)

RULA analysis revealed that none of the participants had acceptable postures (scores 1–2). The majority (85.3%) had grand scores of 3–4, indicating that further investigation and possible changes are required. Additionally, 14.7% had scores of 5–6, suggesting that corrective action should be taken soon (Table 2).

The high prevalence of medium risk levels (Action Level 2) suggests that poor postures are common among students during academic activities. Observational analysis highlighted that students often adopted flexed neck positions (10–20°), elevated or flexed upper arms (45–90°), and extended wrist postures. Prolonged maintenance of these positions has been linked to cervical disc compression, trunk strain, and upper limb discomfort (Pal & Dhara, 2017; Shavit & Golub, 2020; Allread & Vossenas, 2022).

Leg support was adequate among participants, which may have reduced lower limb discomfort. However, the predominance of static and repetitive postures contributed to elevated RULA scores, supporting earlier findings that static awkward postures increase MSD risk (Tantawy et al., 2017; Bare et al., 2021).

Table 2. Ergonomic risk assessment using RULA



Correlation Between MSDs and Ergonomic Risk

Chi-square analysis revealed no statistically significant associations between RULA scores and MSD complaints across body regions (Table 3). This suggests that while poor posture contributes to ergonomic risk, MSD symptoms may arise from a combination of factors, including prolonged exposure, academic stress, and lifestyle habits. These findings align with previous studies that also reported no significant correlation between RULA scores and MSD prevalence (Ismail et al., 2009; Ekawati et al., 2022; Devi et al., 2017).

Nonetheless, literature widely supports the notion that repetitive tasks, awkward postures, and inadequate ergonomics are key contributors to MSD development (Golchha et al., 2014). Therefore, while the present study did not find a direct statistical link, ergonomic interventions remain essential to reduce long-term risk.

Table 3. Correlation between MSDs and ergonomic risk

RULA Component	Associated MSD Regions	χ^2 (p-value)
Upper arms posture	Shoulders	0.921 (0.631)
Lower arms posture	Elbows	1.934 (0.164)
Wrist posture	Wrist/Hand	1.551 (0.461)
Neck posture	Neck	1.109 (0.292)
Trunk posture	Upper back, Lower back	0.021–0.539 (p > 0.46)
Score A (Upper limbs)	Shoulder, Elbow, Wrist/Hand	0.789–2.577 (p > 0.27)
Score B (Neck/Trunk/Legs)	Neck, Upper back, Lower back, Hips, Knees, Ankles	0.831–5.063 (p > 0.16)
Wrist & Arm score	Shoulder, Elbow, Wrist/Hand	0.789–2.577 (p > 0.27)

RULA Component	Associated MSD Regions	χ^2 (p-value)
Neck/Trunk/Leg score	Neck, Back, Hips, Knees, Ankles	0.831–5.063 (p > 0.16)
Grand Score	Multiple body regions	1.107–6.319 (p > 0.09)

CONCLUSION

This study examined the prevalence of work-related musculoskeletal disorders (WMSDs) and ergonomic risk levels among Faculty of Health Sciences students at UiTM Puncak Alam. Findings revealed a high prevalence of musculoskeletal discomfort, with the neck (62.1%), upper back (60.3%), lower back (59.5%), and shoulders (58.6%) being the most frequently reported regions. Nearly half of respondents also reported wrist and hand discomfort. Ergonomic assessment using the Rapid Upper Limb Assessment (RULA) showed that the majority of students (78.4%) scored at medium ergonomic risk levels requiring further investigation, while 14.7% were at higher risk levels necessitating corrective action. However, no statistically significant correlation was found between RULA scores and reported MSD symptoms, suggesting that additional factors such as duration of exposure, individual health status, and study environment may influence outcomes.

Despite offering valuable insights, this study is not without limitations. The cross-sectional design restricts the ability to establish causal relationships between ergonomic risk factors and MSD symptoms. Reliance on self-reported data may have introduced recall bias, leading to possible under- or overestimation of prevalence. Moreover, the sample size was limited to a single faculty and campus, which may reduce the generalizability of findings across the broader student population in Malaysia. Time constraints and limited student availability also posed challenges to data collection.

Future research should address these limitations by employing longitudinal designs to track the development and progression of MSD symptoms over time, thereby strengthening causal inferences. Expanding the sample size across multiple universities and diverse academic programmes would also improve external validity and provide a more representative understanding of MSD prevalence among Malaysian students. The integration of objective measurement tools such as wearable posture trackers, electromyography (EMG), and motion analysis systems could complement self-reported surveys and observational assessments, thereby increasing the accuracy of ergonomic evaluations. Additionally, exploring psychosocial and environmental determinants—including academic stress, ergonomic awareness, and access to supportive learning environments—would broaden the understanding of factors influencing MSD development. Intervention-based studies that evaluate the effectiveness of ergonomic training, posture correction strategies, and classroom redesigns would further provide practical guidance for prevention.

Overall, the findings of this study underscore that health sciences students, despite their academic knowledge of health and safety, remain vulnerable to WMSDs due to prolonged sedentary behaviour and non-ergonomic study conditions. By identifying high-risk anatomical regions and highlighting the prevalence of suboptimal ergonomic postures, this research contributes to the growing recognition of MSDs as a significant concern not only in occupational but also in educational contexts. Future efforts that incorporate robust methodologies and targeted interventions are essential for reducing the burden of MSDs, protecting student health, and ensuring long-term musculoskeletal well-being.

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