Sri Lanka Journal of Physiotherapy and Rehabilitation Sciences

Original article

Musculoskeletal pain among final-year undergraduates at the University of Colombo: Prevalence and association with stress and body mass index

R A M D Ranatunga[1*] & M Rajasuriya[2]

*Correspondence: menujadr@gmail.com https://orcid.org/0009-0003-0484-8578

Received on 29 Oct 2025

Accepted on 14 Feb 2026

ABSTRACT

Background & Aim: Musculoskeletal pain is a leading cause of long-term functional impairments globally, increasingly affecting younger populations due to sedentary lifestyles and academic stress. Despite growing international research, limited data exist on the interrelationship between musculoskeletal pain and stress among undergraduates in Sri Lanka. This study aims to determine the prevalence and distribution of musculoskeletal pain among final-year students at the University of Colombo and to assess its associations with stress level, body mass index (BMI), and musculoskeletal pain.

Methods: A cross-sectional analytical study was conducted among 420 final-year undergraduates across five faculties of the University of Colombo. Musculoskeletal pain was assessed using the Standardized Nordic Musculoskeletal Questionnaire (SNMQ), while stress level was evaluated using a modified Student Life Stress Inventory (SLSI). BMI was calculated based on height(kg) and weight(m) (kg/m²). Data were analysed by descriptive statistics and inferential statistical tests including Pearson correlation test using SPSS version 26.

Results: The 12-month and 7-day point prevalence of musculoskeletal pain were 82.1% and 64.5%, respectively. The lower back (48.8%), neck (46.7%), and upper back (42.4%) were the most affected regions, with 49.3% reporting interference with daily activities. Medical students showed the highest musculoskeletal pain prevalence (91.8%). A significant association was observed between stress level and musculoskeletal pain in the neck, shoulders, upper and lower back ($p<0.05$). BMI was significantly associated with lower back ($p = 0.018$) and knee pain ($p = 0.047$). Females reported higher stress levels, especially in response to academic changes and pressures.

Conclusions & Recommendations: Musculoskeletal pain is highly prevalent among final-year undergraduates at the University of Colombo, with stress emerging as a key contributor, particularly to axial pain. Context-specific interventions combining ergonomic and psychological strategies are essential to address this dual burden.

Keywords: *musculoskeletal pain, stress, university students, body mass index, Sri Lanka.*

Introduction

Musculoskeletal pain is among the leading global causes of long-term physical disability, and loss of productivity, affecting millions across all age groups (1,2). They encompass a wide range of inflammatory and degenerative conditions involving muscles, tendons, ligaments, joints, and associated neurovascular structures (3,4). Although traditionally associated with occupational exposure, Musculoskeletal pain is increasingly observed in younger populations, particularly among university students, due to academic demands, sedentary behaviour, and suboptimal ergonomics (5,6). The global prevalence of musculoskeletal pain among university students ranges from 32.9% to 89.3%, with low back, neck, and shoulder regions most commonly affected (6,7). While physical factors such as prolonged static posture, repetitive tasks, and poor workstation design remain well-documented contributors (8), a growing body of research has highlighted the significance of psychosocial risk factors, particularly academic stress (9,10, 11).

Academic stress, defined as the physiological and psychological response to academic-related demands that exceed available resources, is a prevalent concern among undergraduates, especially in high-pressure disciplines such as medicine and health sciences (12,14). Sources of stress include time constraints, high workload, examinations, financial concerns, and social pressures (15,17). Chronic academic stress activates the hypothalamic-pituitary-adrenal (HPA) axis, leading to elevated cortisol and catecholamine levels, which disrupt muscle perfusion, increase muscle tone, and impair tissue recovery, thereby contributing to the development or exacerbation of musculoskeletal pain (18, 19,20). In addition, stress-induced physiological responses can trigger pro-inflammatory pathways and alter immune function, further increasing vulnerability to musculoskeletal pain (21,22).

Body mass index (BMI) is another important factor implicated in musculoskeletal pain development. Excessive body weight exerts additional mechanical stress on weight-bearing joints such as the lumbar spine and knees, predisposing individuals to chronic pain and disability (23). Studies have shown a positive correlation between increased BMI and musculoskeletal pain symptoms across working and student populations (24,25). Furthermore, chronic stress has been associated with behaviours such as emotional eating and reduced physical activity, both of which contribute to increased BMI, suggesting a potential synergistic interaction between stress and body weight in musculoskeletal pain pathogenesis (26). Gender differences have also been observed in both stress perception and musculoskeletal symptomatology. Female students often report higher stress levels and are more likely to experience musculoskeletal pain, possibly due to hormonal influences, reduced muscle mass, and greater reporting tendencies (27, 28). Despite the evident multifactorial nature of musculoskeletal pain in student populations, limited studies in Sri Lanka have comprehensively explored the interrelationships among stress and musculoskeletal pain.

This study aims to determine the prevalence and distribution of musculoskeletal pain among final-year undergraduates of the University of Colombo and to assess the associations between stress level and musculoskeletal pain. By identifying key risk factors in this unique academic setting, findings can guide targeted interventions to enhance student well-being and academic performance.

Methods

Study design and participants

A cross-sectional analytical study was conducted among final year undergraduate students of the

University of Colombo, Sri Lanka. The study population included students from the faculties of medicine, science, management and finance, law, arts and assessments were carried out at the beginning of their final academic year. Participants were excluded if they were actively engaged in competitive athletics, had any recent fractures or sports injuries, diagnosed with diabetes mellitus or other non-communicable diseases, declined to participate, or provided inadequate responses on the administered questionnaires.

Data collection

A total sample of 420 students was selected from each of the 5 aforementioned faculties. To recruit participants, student lists were obtained from the respective faculties, and permission was sought to access lecture halls following scheduled lectures. On the designated day, information sheets and consent forms were distributed to randomly selected students. After obtaining informed written consent, participants were invited to a nearby, quiet lecture hall within their faculty to complete two self-administered questionnaires within 20 minutes. The information sheet provided a brief overview of the study's purpose, procedures, types of data collected, potential risks and benefits of participation, and the expected time commitment. The consent form included details on voluntary participation, confidentiality, right to withdraw, and investigator contact information. All documents were written in clear, accessible language.

Demographic data were first collected, including age, sex, faculty, area of residence, and selected lifestyle habits such as smoking, alcohol use, and physical activity. Musculoskeletal pain symptoms were assessed using the Standardized Nordic Musculoskeletal Questionnaire (SNMQ) (29), which captured the presence or absence of pain or discomfort in nine anatomical regions (neck, shoulders, elbows, wrists, upper back, lower back, hips, knees, and ankles) within the past 12 months and past 7 days. This tool allowed for the identification of both point and period prevalence of musculoskeletal symptoms through binary responses, being "yes" or "no".

Psychological stress was evaluated using a Modified Student Life Stress Inventory (SLSI) (30), which included 52 binary (yes/no) items. This inventory assessed both academic stressors and responses to stress, organized into subdomains: stressors (frustrations, conflicts, pressures, changes, and self-imposed stress) and reactions (physiological, emotional, behavioural, and cognitive). The maximum possible score was 52, with scores ranging from 0–27 indicating low response to stress, and scores from 28–52 reflecting high response to stress. Scores were also analysed by subdomain.

Both the SNMQ and the modified SLSI were translated into Sinhala and Tamil using a translation and back-translation process to ensure linguistic and conceptual accuracy. These translated versions were pilot tested on 20 students; students recruiting from each faculty. Further explanations were provided during data collection if any student encountered difficulty understanding a questionnaire item.

Data collection was conducted in a quiet lecture hall within each faculty to ensure privacy and minimize distractions. Contrary to self-administration, both questionnaires were administered using an interviewer-administered approach by the principal investigator and trained data collectors. Each interview lasted approximately 20 minutes. Interviewers read out each question verbatim and recorded participant responses. This approach was adopted to ensure uniform administration across participants, to minimize misunderstanding of questionnaire items, to improve response completeness and to address potential language or literacy barriers. Clarifications were provided when participants requested further explanation, without leading or influencing responses.

Statistical analysis

Data were analysed using both descriptive and inferential statistics with Statistical Package for Social Sciences (SPSS) version 26 software.

Ethical considerations

Ethical approval for the study was obtained from the Ethics Review Committee of the Faculty of Medicine, University of Colombo, Sri Lanka (ERC reference number: UCP/AL/15/330), Sri Lanka. Additional approvals were secured from the Vice Chancellor of the University of Colombo and the Deans of the participating faculties. All participants were fully informed about the study, and their participation was voluntary. Confidentiality was maintained throughout the study by anonymising data, assigning identification numbers to participants, and securely storing data in password-protected files. Personal identifiers were destroyed following the completion of data collection, ensuring participants' privacy was upheld throughout the research process.

Results

Distribution of sociodemographic characteristics

A total of 420 students took part in the study, with a higher representation of females (57.1%, n=240) compared to males (42.9%, n=180) (Table 1). The mean age of the participants was mean = 26, with a standard deviation (SD) = 1.9 years. The majority of participants were from the Faculty of Management and Finance (38.1%, n= 60) followed by the Faculty of Medicine (26.2%, n=110).

BMI distribution among final year students of the University of Colombo

The BMI distribution of participants (Table 2) shows notable gender differences. A significantly higher proportion of females (15.0%) were underweight compared to males (6.7%), while more females (50.0%) fell into the normal BMI range than males (40.0%). In contrast, both overweight and obesity were more prevalent among males, with 26.7% in each category, compared to 17.5% of females. These findings indicate that while females tended to have a healthier BMI distribution with a higher percentage in the normal range, males were more likely to have excess body weight, reflected by the higher rates of overweight and obesity.

Table 1. The demographic data of participants

	Category	No.	Percentage (%)
Gender	Male	180	42.9
	Female	240	57.1
Academic programme	Faculty of Arts	30	7.1
	Faculty of Law	45	10.7
	Faculty of Management and Finance	160	38.1
	Faculty of Medicine	110	26.2
	Faculty of Science	75	17.9
Total		420	100

Data are presented as frequency (n) and percentages (%)

Table 2. Body mass index distribution of participants by gender (Based on Asia-Pacific criteria)

BMI category	Male		Female		Total	
	No.	Percentage (%)	No.	Percentage (%)	No.	Percentage (%)
Underweight (<18.5)	12	6.7	36	15.0	48	11.4
Normal (18.5–22.9)	72	40.0	120	50.0	192	45.7
Overweight (23.0–24.9)	48	26.7	42	17.5	90	21.4
Obese (≥25.0)	48	26.7	42	17.5	90	21.4
Total	180	100%	240	100%	420	100%

BMI: Body mass index

Data are presented as frequency (n) and percentages (%)

Table 3. Musculoskeletal pain prevalence by body region (n=420)

Body Region	12-Month Prevalence [a] No. (%)	Severity Affecting ADL [b] No. (%)	7-Day Point Prevalence [c] No. (%)
Total (Any site)	345 (82.1)	207 (49.3)	271 (64.5)
Neck	196 (46.7)	60 (14.3)	118 (28.1)
Shoulder	170 (40.5)	55 (13.1)	99 (23.6)
Elbow	73 (17.4)	21 (5.0)	39 (9.3)
Wrists & hand	108 (25.7)	39 (9.3)	65 (15.5)
Upper back	178 (42.4)	57 (13.6)	122 (29.0)
Lower back	205 (48.8)	82 (19.5)	139 (33.1)
Hip	80 (19.0)	28 (6.7)	45 (10.7)
Knee	127 (30.2)	46 (11.0)	78 (18.6)
Ankle & feet	95 (22.6)	33 (7.9)	58 (13.8)

Data are presented as frequency (n) and percentages (%)

[a] *12-Month Prevalence refers to the number of students who reported musculoskeletal pain symptoms in the respective region at any point in the past 12 months.*

[b] *Severity Affecting ADL indicates students who reported that symptoms in that region interfered with their ability to perform activities of daily living.*

[c] *7-Day Point Prevalence represents those who experienced symptoms within the 7 days prior to data collection.*

Prevalence of musculoskeletal pain

The findings (Table 3) reveal a high burden of musculoskeletal pain among the participants, with a 12-month prevalence of 82.1% and a 7-day point prevalence of 64.5%, indicating both chronic and acute symptoms. The lower back region is the most affected in terms of both prevalence (48.8%) and severity, with 19.5% of students reporting interference with activities of daily living (ADL). Neck (46.7%) and upper back (42.4%) regions also showed high prevalence rates, with notable functional impact (14.3% and 13.6%, respectively), suggesting that axial musculoskeletal complaints are particularly common. Furthermore, 49.3% of the students experienced symptoms severe enough to disrupt daily functioning, underscoring the clinical significance of these disorders within this population.

Relationship between academic programme and prevalence of musculoskeletal pain

The academic programme seems to impact

statistically significantly (p<0.001) on the development of musculoskeletal disorders among final year students (Table 4). Notably, students in the Faculty of Medicine demonstrated a significantly higher 12-month prevalence of musculoskeletal pain (91.8%, p=0.003) compared to other faculties. Furthermore, a significant difference was also observed in the 7-day point prevalence of musculoskeletal pain among medical students (78.2%, p=0.004), indicating ongoing symptom burden. In contrast, students from the Faculty of Science, Faculty of Law, and Faculty of Management and Finance did not show statistically significant differences in the 12-month prevalence (p=0.06, p=0.06, and p=0.007 respectively), although the value for management and finance was borderline. Similarly, the 7-day point prevalence in these faculties did not reach statistical significance (p>0.05). Students in the faculty of arts showed the lowest prevalence and no significant difference in both time frames. These findings suggest that academic demands and study environments, particularly in medical education, may contribute more heavily to the development of musculoskeletal pain.

Overall distribution of stressors

The analysis of mean scores from the SLSI among final-year students (n=420) revealed significant differences in both stressors and reactions to stressors across varying levels of perceived stress (Table 5). Students categorized under the severe stress level reported markedly higher total stressor scores (mean=84.67, SD=10.67) compared to those with moderate (mean=75.61, SD=10.20) and mild (mean=66.66, SD=10.85) stress levels, with this difference being highly significant (p<0.001). Across all specific domains of stressors such as frustrations, conflicts, pressures, changes, and self-imposed stressors, there was a consistent and statistically significant increase in mean scores corresponding to the increasing severity of stress (all p < 0.001). For instance, self-imposed stressors showed a progressive rise from mild (20.11) to moderate (22.02) and severe (23.97) stress levels.

Table 4. Association between academic programme and prevalence of musculoskeletal pain (MP) among final year students

Academic programme	12-month prevalence of MP No. (%)	*p* value [a]	7-day point prevalence of MP No. (%)	*p* value [a]
Faculty of Medicine	101 (91.8)	0.003*	86 (78.2)	0.004*
Faculty of Management and Finance	130 (81.3)	0.007	96 (60.0)	0.081
Faculty of Science	59 (78.6)	0.060	46 (61.3)	0.078
Faculty of Law	34 (75.6)	0.060	26 (57.8)	0.093
Faculty of Arts	21 (70.0)	0.089	16 (53.3)	0.115
Total	345 (82.1)	—	271 (64.5)	—

Data are presented as frequency (n) and percentages (%)

[a] *Significance according to chi-square test*

**Statistically significant at p < 0.05*

Table 5. Distribution of stressors scores among final year students

SLSI Domain (stressors)	Mild (n=154) Mean (SD)	Moderate (n=153) Mean (SD)	Severe (n=113) Mean (SD)	*p* value [a]
Stressors (Total score)	66.66 (10.85)	75.61 (10.20)	84.67 (10.67)	<0.001*
Frustrations	15.89 (4.03)	18.26 (3.88)	20.42 (4.82)	<0.001*
Conflicts	9.71 (2.86)	11.04 (2.67)	12.23 (3.21)	<0.001*
Pressures	13.96 (3.07)	15.69 (2.66)	17.51 (1.98)	< 0.001*
Changes	6.98 (2.36)	8.57 (2.46)	10.84 (2.85)	< 0.001*
Self-imposed	20.11 (4.02)	22.02 (3.86)	23.97 (3.58)	< 0.001*

SLSI: Student Life Stress Inventory, SD: standard deviation
Data are presented as mean and standard deviation (SD)
[a] *Significance according to the one-way analysis of variance test*
Statistically significant at p < 0.001

Similarly, reactions to stressors were significantly elevated among students with higher stress levels. The total reaction scores increased from 60.30 (SD=13.70) in the mild group to 74.38 (SD=13.48) in the moderate group and further to 88.18 (SD=16.76) in the severe group (p<0.001). Subdomain analyses revealed that physiological, emotional, and behavioural responses were significantly more intense in students experiencing moderate and severe stress, with all domains showing p-values less than 0.001. Cognitive appraisal also varied significantly across groups (p<0.05), though with a comparatively smaller difference in mean values. The total inventory score, representing overall stress impact, followed a clear ascending trend with increasing stress severity, ranging from 126.96 (SD=21.63) in the mild group to 172.85 (SD=24.04) in the severe group (p<0.0001). These findings underscore the strong association between stress levels and both the perceived sources of stress and the magnitude of stress-related responses among final-year university students.

Distribution of stressors by gender

The analysis of stressor distribution by gender among the 420 final year students revealed notable gender-based differences. A significantly higher proportion of females (60.4%) reported elevated stress due to changes compared to males (52.8%) (p=0.009). Similarly, pressure-related stress was more prevalent among females (48.8%) than males (36.1%), showing a statistically significant difference (p=0.001). In contrast, frustration-related stress was significantly higher among males (37.2%) than females (25.8%), also reaching statistical significance (p=0.001). However, there were no statistically significant gender differences observed in conflict-related stress (p=0.819) or self-imposed stress (p=0.064). These findings suggest that while both genders experience multiple stressors, the type and intensity of stress vary, with females more affected by external academic pressures and changes, and males experiencing greater internal frustration.

Overall distribution of reactions to stressors

The analysis of stress reactions (table 6) among final year students revealed significant differences across stress levels in all domains of reaction to stressors. As stress levels increased from mild to severe, mean scores for emotional, behavioural, and physiological reactions rose significantly (p<0.001), indicating a clear escalation in stress responses with severity. Students with severe stress reported the highest emotional reaction scores (mean=15.97, SD=3.68), compared to those with moderate (mean=12.91, SD=3.25) and mild stress levels (mean=9.99, SD=3.60), suggesting that emotional distress intensifies with perceived stress. Similarly, behavioural reactions such as changes in routines or conduct increased from 15.05 (SD=4.07) in the mild group to 22.07 (SD=6.00) in the severe group. Physiological reactions, including symptoms like fatigue, sleep disturbances, and physical tension, also showed a marked increase with severity, rising from 27.30 (SD=7.86) in mildly stressed students to 41.44 (SD=10.60) among those with severe stress. Interestingly, cognitive reactions, such as negative thinking and concentration difficulties, showed only a slight but statistically significant increase ($p<0.050$), indicating that cognitive responses may be less sensitive to changes in stress level compared to other domains. These findings suggest that as stress levels intensify, students are more likely to experience pronounced emotional, behavioural, and physiological responses, emphasizing the need for early stress intervention strategies in academic environments.

Relationship between level of stress, BMI and musculoskeletal pain among final year students of University of Colombo

Table 7 illustrates the association of academic stress levels and BMI with musculoskeletal pain across different body regions by gender among final-year university students (n=420). Academic stress demonstrated statistically significant but weak positive correlations with musculoskeletal pain in the neck (r=0.13 males; r=0.17 females; p=0.003), shoulder (r=0.11 males; r=0.15 females; p=0.012), upper back (r=0.11 males; r=0.14 females; p=0.021), and lower back (r=0.18 males; r=0.24 females; p<0.001), with the strongest association observed in the lower back, particularly among females. No significant associations were identified between academic stress and musculoskeletal pain in the elbow, wrist and hand, hip, knee, or ankle and feet.

Body mass index showed a significant weak positive correlation with musculoskeletal pain in the lower back (r=0.13 males; r=0.11 females; p=0.018) and knee (r=0.12 males; r=0.09 females; p=0.047), indicating a greater influence of BMI on weight-bearing regions. A borderline association was observed for shoulder musculoskeletal pain (p=0.053). Overall, these findings suggest a region-specific pattern, where academic stress predominantly affects upper body and spinal regions, while BMI is more closely associated with lower back and knee pain.

Table 6. Distribution of reactions to stressors among final year students of University of Colombo

Reaction type scores	Mild (n=154) Mean (SD)	Moderate (n=153) Mean (SD)	Severe (n=113) Mean (SD)	*p* value [a]
Total reactions score	60.30 (13.70)	74.38 (13.48)	88.18 1 (6.76)	< 0.001*
Physiological	27.30 (7.86)	34.72 (8.78)	41.44 1 (0.60)	< 0.001*
Emotional	9.99 (3.60)	12.91 (3.25)	15.97 (3.68)	< 0.001*
Behavioural	15.05 (4.07)	18.18 (4.63)	22.07 (6.00)	< 0.001*
Cognitive appraisal	7.95 (2.65)	8.56 (2.47)	8.69 (2.30)	< 0.05**

SD: standard deviation

Data are presented as mean and standard deviation (SD)

[a] *Significance according to the one-way analysis of variance test*

**Statistically significant at p < 0.001, **Statistically significant at p < 0.05*

Table 7. Association of academic stress and body mass index with musculoskeletal pain by body region and gender

Body Region	Stress level			BMI		
	p value	Correlation (r) (Male)	Correlation (r) (Female)	*p* value	Correlation (r) (Male)	Correlation (r) (Female)
Neck	0.003*	0.13	0.17	0.072	0.07	0.08
Shoulder	0.012*	0.11	0.15	0.053	0.08	0.09
Elbow	0.274	0.05	0.06	0.164	0.06	0.07
Wrists & hand	0.087	0.07	0.09	0.109	0.07	0.08
Upper back	0.021*	0.11	0.14	0.064	0.08	0.09
Lower back	<0.001*	0.18	0.24	0.018*	0.13	0.11
Hip	0.145	0.06	0.08	0.231	0.06	0.07
Knee	0.093	0.07	0.09	0.047*	0.12	0.09
Ankle & feet	0.219	0.21	0.05	0.131	0.40	0.40

BMI: Body mass index

**Statistically significant at $p < 0.05$*

[a] Significance according to the one-way analysis of variance test

Discussion

Our study is the first campus wide analysis of the interaction between academic stress and musculoskeletal pain among Sri Lankan undergraduates. The principal findings were (1) an exceptionally high 12 month musculoskeletal pain prevalence of 82.1 % and 7 day prevalence of 64.5 %; (2) axial regions, particularly the low back, are the most affected body regions (3) medical undergraduates bore the greatest musculoskeletal pain burden; (4) stress scores on every SLSI domain rose step wise from the mild to severe stress groups and were paralleled by escalating physiological, emotional and behavioural reactions; and (5) higher stress level was significantly associated with musculoskeletal pain of the neck, shoulders, upper back and low back, while higher BMI was linked to low back and knee pain. These observations are discussed below considering existing literature, plausible mechanisms, and implications for prevention.

Our 12 month prevalence (82.1 %) lies within the global undergraduate range of 32.9 – 89.3 % (31) and exceeds the 73.6 % reported among allied health trainees in another Sri Lankan university (32). Internationally, comparable or slightly lower figures have been noted in Canadian multi faculty cohorts (59–67 %) (33) and in a pandemic era scoping review (cervical 69.9 %, lumbar 63.4 %) (34), situating Colombo finalists near the upper extreme of published rates.

Low back pain (LBP) was the dominant site (48.8 %), followed by neck (46.7 %) and upper back (42.4 %) symptoms, reproducing the "axial triad" pattern described among Saudi health profession students (neck 55 %, LBP 48 %) (35) and Canadian undergraduates (LBP 61–69 %, neck ≤77 %) (36). Conversely, Australian dental students reported the neck as the lead site (64.3 %) with lower rates of LBP (37), illustrating how discipline specific ergonomics (static trunk flexion) modulate regional risk.

Almost half of our respondents (49.3 %) stated that pain limited ADL. The proportion matches the 43–49 % functional impairment seen at two Canadian universities (36) and confirms that student pain is often clinically consequential rather than trivial. Medical students had the highest 12-month (91.8 %) and 7-day (78.2 %) prevalence. Similar "medical school effects" have been recorded in Pakistan (38) and Canada (33), and dental trainees exhibit even higher figures (94 %) (39). Clinical curricula impose prolonged standing, awkward postures during ward or laboratory work, and heavier academic pressure, all of which amplify both biomechanical loading and psychophysiological stress.

Nearly 25% (n =101) of our sample fell into the severe stress band, with women significantly overrepresented, a pattern replicated in European (40) and Middle Eastern medical schools (41). Females scored higher on change and pressure related stressors, whereas males reported greater frustration. Prior research suggests that observed gender differences may be attributed to variations in coping mechanisms and psychosocial expectations, whereby women are more likely to internalise and emotionally process stress, while men tend to externalise stress through behavioural or physiological responses (42–44). Cognitive appraisal scores, in contrast, showed only small sex differences, echoing findings from American campuses (45).

Academic stress was positively associated with musculoskeletal pain in four axial regions (neck, shoulders, upper and lower back), with the strongest relationship for LBP ($p < 0.001$). Comparable correlations have been demonstrated in Saudi (35), Canadian (33) and Nigerian cohorts (46), whereas studies in Pakistan (38) and Japan (47) failed to find such links, suggesting that contextual factors such as study environment, coping resources, cultural norms—modulate the stress–pain pathway. Physiologically, sustained mental stress increases muscle spindle discharge and sympathetic vasoconstriction, leading to low level but persistent contraction, particularly in postural muscles of the neck and trunk (48). Repeated over months, this elevates intramuscular pressure, reduces oxygenation and precipitates nociceptor sensitisation, providing a plausible mechanistic bridge between stress and the axial triad of musculoskeletal pain (49).

Elevated BMI was significantly associated with low back pain (LBP) and knee pain, which are both weight-bearing anatomical regions. Similarly, research among Malaysian medical students reported a positive association between higher BMI and the prevalence of LBP (50). In contrast, no significant association was observed between BMI and neck pain in the present study, consistent with meta-analytic evidence indicating that mechanical loading plays a less prominent role in the aetiology of cervical spine disorders compared to lumbar or knee conditions (51).

This study includes a large, multi faculty sample; simultaneous measurement of psychosocial (SLSI) and physical (Nordic Questionnaire) factors with validated tools; and analysis of both prevalence and functional impact. However, the cross-sectional design precludes causal inference; recall bias may inflate 12 month and 7-day estimates; pain and stress were self reported without clinical confirmation; and unmeasured covariates (sleep, physical activity, work-station ergonomics) could confound associations.

Our data underscored an urgent need for dual pathway interventions. At the biomechanical level, interventions such as ergonomic education, adjustable seating, and the implementation of scheduled micro-breaks should be prioritised, particularly within clinically intensive academic programmes. Psychologically, universities should integrate stress management workshops, peer support, and counselling services into curricula. Prospective studies are warranted to establish temporal links, evaluate intervention efficacy, and explore moderators such as resilience, sleep hygiene and physical fitness.

Conclusions

Musculoskeletal pain is highly prevalent among final-year undergraduates at the University of Colombo, with nearly half suffering function-limiting pain. Stress level is associated with axial musculoskeletal pain, while higher BMI compounds risk in load bearing regions. Comprehensive, context sensitive strategies that combine ergonomic modification with stress reduction are therefore essential to safeguard the musculoskeletal health and academic performance of Sri Lankan undergraduates.

Author Affiliations

[1]Department of Allied Health Sciences, Faculty of Medicine, University of Colombo, [2]Department of Psychiatry, Faculty of Medicine, University of Colombo

Author Declarations

Competing interests: The authors declare that they have no competing interests.

Funding: The study was fully self-funded by the investigator.

Acknowledgements: We thank all the participants of this study and to the Research Stream of the Department of Allied Health Sciences, Faculty of Medicine, University of Colombo.

Author contributions: Both authors have contributed to the manuscript through data collection, data analysis, and writing.

References

1. Bernard B, editor. Musculoskeletal disorders and workplace factors: a critical review of epidemiologic evidence for work-related musculoskeletal disorders of the neck, upper extremity, and low back. Washington (DC): U.S. Department of Health and Human Services; 1997. p. 97–141.
2. Woolf AD, Akesson K. Understanding the burden of musculoskeletal conditions. BMJ. 2001;322(7294):1079–80.
3. Picavet HS, Schouten JS. Musculoskeletal pain in the Netherlands: prevalence, consequences and risk groups, the DMC (3) -study. Pain. 2003;102(1-2):167–78.
4. Guo HR, Chang YC, Yeh WY, Chen CW, Guo YL. Prevalence of musculoskeletal disorder among workers in Taiwan: a nationwide study. J Occup Health. 2004;46(1):26–36.
5. Deeney C, O'Sullivan L. Work related psychosocial risks and musculoskeletal disorders: potential risk factors, causation and evaluation methods. Work. 2009;34(2):239–48.
6. Abledu JK, Offei EB. Musculoskeletal disorders among first year Ghanaian students in a nursing college. Afr Health Sci. 2015;15(2):444–9.
7. Walker-Bone K, Cooper C. Hard work never hurt anyone: or did it? A review of occupational associations with soft tissue musculoskeletal disorders of the neck and upper limb. Ann Rheum Dis. 2005;64(10):1391–6.
8. Warren N. Causes of musculoskeletal disorders in dental hygiene students: A study of combined biomechanical and psychosocial risk factors. Work. 2010;35(4):441–54.
9. Magnavita N, Elovainio M, De Nardis I, Heponiemi T, Bergamaschi A. Environmental discomfort and musculoskeletal disorders. Occup Med (Lond). 2011;61(3):196–201.
10. Nahit ES, Hunt IM, Lunt M, Dunn G, Silman AJ, Macfarlane GJ. Effects of psychosocial and individual psychological factors on the onset of musculoskeletal pain: common and site-specific effects. Ann Rheum Dis. 2003;62(8):755–60.
11. Ross SE, Niebling BC, Heckert TM. Sources of stress among college students. Coll Stud J. 1999;33(2):312–7.

12. Ekpenyong CE, Davis KJ, Akpan UP, Daniel NE. Academic stress and menstrual disorders among female undergraduates in Uyo, South Eastern Nigeria—the need for health education. Niger J Physiol Sci. 2011;26(2):193–8.
13. Westerman GH, Grandy TG, Ocanto RA, Erskine CG. Perceived sources of stress in the dental school environment. J Dent Educ. 1993;57(3):225–31.
14. Salami SO. Psychological correlates of career indecision among secondary school adolescents. Niger J Appl Psychol. 2001;6(2):116–25.
15. Blonna R. Coping with stress in a changing world. 3rd ed. Boston (MA): McGraw Hill; 2005. p. 254–68.
16. Wurtman RJ, Wurtman JJ. Carbohydrates and depression. Sci Am. 1989;260(1):68–75.
17. Yang TC, Matthews SA, Chen VY. Stochastic variability in stress, sleep duration, and sleep quality across the distribution of body mass index: insights from quantile regression. Int J Behav Med. 2014;21(2):282–91.
18. Viester L, Verhagen EA, Oude Hengel KM, Koppes LL, van der Beek AJ, Bongers PM. The relation between body mass index and musculoskeletal symptoms in the working population. BMC Musculoskelet Disord. 2013;14:238.
19. Dallman MF, Pecoraro N, Akana SF, La Fleur SE, Gomez F, Houshyar H, et al. Chronic stress and obesity: a new view of "comfort food". Proc Natl Acad Sci U S A. 2003;100(20):11696–701.
20. Khansari DN, Murgo AJ, Faith RE. Effects of stress on the immune system. Immunol Today. 1990;11(5):170–5.
21. Matalka KZ, Sidki AM, Abdul-Malik SA, Thewaini AJ. Academic stress influences Epstein-Barr virus and Cytomegalovirus reactivation, cortisol and prolactin levels. Lab Med. 2000;31(3):163–8.
22. Michie F, Glachan M, Bray D. An evaluation of factors influencing the academic self-concept, self-esteem and academic stress for direct and re-entry students in higher education. Educ Psychol. 2001;21(4):455–72.
23. Kagan J, Baird A. Brain and behavioural development during childhood. In: Gazzaniga MS, editor. The cognitive neurosciences. Cambridge (MA): MIT Press; 2004. p. 93–104.
24. Al-Ayadhi LY. Neurohormonal changes in medical students during academic stress. Ann Saudi Med. 2005;25(1):36–40.
25. Sami-Abdo RA, Redhwan AA, Mustafa AA, Krishna GR. Stress and coping strategies of students in a medical faculty in Malaysia. Malays J Med Sci. 2011;18(3):57–64.
26. Ostergren PO, Hanson B, Balogh I, Ektor-Andersen J, Isacsson A, Orbaek P, Winkel J, Isacsson SO.;Incidence of shoulder and neck pain in a working population: effect modification between mechanical and psychosocial exposure at work? J Epidemiol Community Health. 2005;59(9):721–8.
27. Allsworth J, Clarke J, Peipert F, Hebert R, Cooper A, Boardman L. AThe influence of stress on the menstrual cycle among newly incarcerated women. Women Health. 2007;17(4):202–9.
28. Smith DR, Wei N, Ishitake T, Wang RS. Musculoskeletal disorders among Chinese medical students. Kurume Med J. 2005;52(1–2):139–46.
29. Crawford JO. The Nordic Musculoskeletal Questionnaire. Occup Med (Lond). 2007;57(4):300–301.
30. Gadzella BM, Baloglu M, Masten WG, Wang Q. Evaluation of the student life-stress inventory-revised. Journal of instructional

psychology. 2012 Jun 1;39(2).

31. Abledu JK, Offei EB. Musculoskeletal disorders among Ghanaian nursing students: prevalence and risk factors. Int J Res Health Sci. 2015;3(1):3744.
32. Senarath U, Fernando P, Wickramasinghe V. Prevalence and risk factors of musculoskeletal pain among allied health undergraduates in Sri Lanka. Ceylon Med J. 2021;66(2):72-78.
33. Nouri Parto H, Sharan R, Kim A, et al. Musculoskeletal symptoms and mental health correlates among Canadian university students: a multi faculty survey. BMC Musculoskelet Disord. 2023;24:1020.
34. Popescu D, Ionescu E. Musculoskeletal complaints during COVID 19 e learning: a global scoping review. J Bodyw Mov Ther. 2024;33:217-226.
35. Almuwais AA, Alshammari SA, Alsulaiman SM, et al. Perceived stress and multi site musculoskeletal pain in Saudi health profession students. Majmaah J Health Sci. 2023;11(1):17-23.
36. Campbell A, Côté P, Cancelliere C, et al. One week prevalence and burden of neck and low back pain in Canadian post secondary students. Chiropr Man Therap. 2023;31:23.
37. Hayes MJ, Smith DR, Taylor JA. Musculoskeletal disorders and symptom severity among Australian dental students. J Dent Educ. 2009;73(7):794-802.
38. Hasan MM, Yaqoob U, Ali SS, Siddiqui AA. Frequency of musculoskeletal pain and associated factors among Karachi undergraduates. Case Rep Clin Med. 2018;7(2):131-145.
39. Felemban RA, Sofi RA, Alhebshi SA, et al. Predictors of musculoskeletal pain among Saudi dental students. Clin Cosmet Investig Dent. 2021;13:419 29.
40. Öhman PO, Stålnacke BM. Gender differences in perceived stress among Swedish university students. Scand J Public Health. 2005;33(4):260-264.
41. Sani M, Mahfouz MS, Bani I. Prevalence of stress among medical students in Jizan, Saudi Arabia. Saudi J Med Med Sci. 2012;2(1):46 51.
42. Sharma R, Wavare RR. Academic stress and depression among Indian medical students: a gender analysis. Medica Innovatica. 2013;2(2):15 18.
43. Bayram N, Bilgel N. Depression, anxiety and stress among Turkish university students. Soc Psychiatry Psychiatr Epidemiol. 2008;43(8):667 72.
44. El Ansari W, Stock C. Physical and psychological health of UK undergraduates and its relation to academic performance. Int J Environ Res Public Health. 2010;7(2):509 27.
45. Misra R, Castillo LG. Academic stress among American and international students: a comparative study. Int J Stress Manag. 2004;11(2):132-148.
46. Ihegihu EYN, Okolo CA, Afolabi TO, et al. Academic stress, coping and musculoskeletal disorders in Nigerian health science undergraduates. Scholastic Med Sci. 2024;1(9):1-6.
47. Sakakibara T, Mizuno T, Kasai Y. Prevalence of chronic pain among Japanese university students. Austin Pain Relief. 2020;3(1):1007.
48. Sjøgaard G, Lundberg U, Kadefors R. The role of muscle activity and mental load in the development of musculoskeletal disorders. Eur J Appl Physiol. 2000;83(2 3):190-199.
49. Magnavita N, Elovainio M. Work related stress and upper limb musculoskeletal disorders: a review. Occup Med (Lond). 2011;61(6):422-432.
50. Yusoff MSB, Esa AR, Mat Pa MN, Mey SC,

Aziz RA, Abdul Rahim AF. Prevalence and associated factors of low back pain among medical students in a Malaysian Medical School. Education in Medicine Journal. 2013;5(2):e74–e81.

51. Hoy D, Protani M, De R, Buchbinder R. The epidemiology of neck pain. Best Practice & Research Clinical Rheumatology. 2010;24(6):783–92.