Original Article

Musculoskeletal disorder prevalence and its correlation with stress in medical students: A cross sectional survey

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Abstract

Background: The study aimed to evaluate musculoskeletal disorder (MSD) prevalence and its correlation with stress in medical students at Umm Al-Qura University (UQU) in Saudi Arabia. **Methods:** A total of 416 participants participated in this study by answering an online questionnaire. We included medical students from UQU of both genders, ranging from the first year to the sixth year. A questionnaire was used to capture sociodemographic data. The data were collected using the Kessler Psychological Distress Scale (K-10) and Standardized Nordic questionnaire. **Results:** Among 416 medical students surveyed, 219 (52.60%) were males. A significant proportion of participants, 294 (70.70%), reported experiencing pain during the last 12 months. Female students exhibited significantly higher scores of MSDs compared to their male counterparts. Students who reported working between 51–90 hours per week had a significantly higher MSD score than those who worked 0–50 hours or 91 or more hours. The findings of this study indicated that the most prevalent MSDs were low back pain (50.20%), followed by neck pain (31.70%), and female medical students exhibited significantly higher stress levels than male medical students. **Conclusions:** Musculoskeletal disorders represent a prevalent health issue among medical students, there is a significant association between factors such as being a female and body mass index. Additionally, psychological stress is a widespread concern among medical students, given the demanding nature of their lifestyle. Interestingly, our findings revealed that there exists a moderately positive relationship between musculoskeletal disorders and stress in this particular population.

Keywords: Low back pain, musculoskeletal disorder, neck pain, pain, stress

Introduction

The term "musculoskeletal disorders" (MSDs) encompasses a wide range of conditions affecting bones, muscles, connective tissues, and joints.[1] In young individuals, several work-related risk factors have been identified, including physical factors such as workload, poor working positions, and ergonomic aspects, as well as psychosocial, socioeconomic, environmental, and individual factors like gender.[2] Stress is a psychological and physical reaction to the ever-increasing demands of life.[3] Internationally, significant stress is common among medical students in the United States and Canada.[4] It has also been established as a common issue among Arab medical students.[5]

This cross-sectional survey aims to assess the prevalence of musculoskeletal disorders among medical students and explore the potential correlation between these disorders and stress levels at Umm Al-Qura University (UQU) in Saudi Arabia. The results from this study can contribute to a deeper understanding of the health challenges faced by medical students and pave the way for targeted interventions to enhance their overall well-being and success in medical education and practice.

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Material and Procedures

A cross-sectional study was conducted from April 2023 to October 2023 at the College of Medicine in Umm Al-Qura University (UQU), Kingdom of Saudi Arabia. The survey was administered to students in the College of Medicine across all years from the first to sixth year after stating the study aims and taking consent. A total of 416 participants participated in the study. We included medical students from UQU of both genders, spanning from the first year to the sixth year. Students from other universities and different specialties were excluded. Interns were also excluded.

The research questionnaire consists of three parts. The first part covered sociodemographic data (gender, age, height, weight, study year, marital status, smoking, educational level, and presence of chronic diseases). In the second part, we adopted the Standardized Nordic Questionnaire to assess and analyze the musculoskeletal system symptoms.[6]

The third part included the Kessler Psychological Distress Scale (K-10) questionnaire to evaluate psychological stress. The K-10 questionnaire aimed to evaluate mental well-being, by providing 10 responses, each one is rated on a Likert scale of 5 points, starting from "none of the time" to "all the time". The scores ranged from a minimum of ten to a maximum of fifty, with the following categories: less than 20 for a healthy individual, 20–24 for low stress, 25–29 for moderate stress, and 30–50 for severe stress. We classified participants based on their stress levels into two groups: participants with a stress score less than 20 "average" and participants with a stress score more than 20 "abnormal". The K-10 questionnaire is extensively employed in health surveys and demonstrates strong psychometric assessment, boasting a Cronbach's alpha of 0.89 with a 95% confidence interval (CI) of 0.88-0.90.[7]

Sampling procedures

The minimum sample size required for this study was calculated by Calculator.net, in consideration of the following: the total number of all medical students from first to 6th year in UQU, according to (Vice-dean Academic Affairs) is approximately 1200 students, keeping the confidence interval (CI) level at 95% and considering anticipated % of frequency as 50% and taking design effect as 1. The sample size was calculated to be 292 participants.

Data analysis

The statistical analysis was conducted using SPSS (IBM version 26). Categorical sociodemographic data were presented as frequencies and percentages, as were the results for musculoskeletal disorders and the Kessler Psychological Distress Scale. The musculoskeletal disorder questions were summed, resulting in a numerical variable. Similarly, the questions from the Kessler Psychological Distress Scale were summed to create a numerical variable. To explore the relationship between musculoskeletal disorders and the Kessler Psychological Distress Scale, the Spearman correlation was employed. Additionally, Mann-Whitney and Kruskal-Wallis tests were utilized to compare sociodemographic data with the two primary numerical outcome variables.

Generalized linear regression models were constructed to predict musculoskeletal disorders and Kessler's Psychological Distress based on statistically significant sociodemographic variables. The results of the regression were presented as beta coefficients along with their respective 95% confidence intervals. A P value of < 0.05 was considered indicative of statistical significance.

Results

The study collected data from a total of 416 medical students, of whom 219 (52.60%) were males. Examining the distribution of participants across different study years, the majority of participants were in 1st year, accounting for 88 (21.20%). In terms of smoking habits, a vast majority of participants, specifically 377 (90.60%) reported being non-smokers. Regarding marital status, the majority of medical students were single, comprising 407 (97.80%) of the participants.

When asked about the presence of chronic diseases, a majority of participants 395 (95.00%) reported that they did not have any chronic diseases. As for the distribution of participants based on weight, a significant portion of them, specifically 319 (76.70%), fell into the weight category of 50–100 kg. In terms of height distribution, a substantial number of participants in total 261 (62.70%), had heights falling within the range of 140–170 cm. Examining the age distribution of the participants, a notable proportion, comprising 243 (58.40%), fell within the age range of 21–30 years. Regarding their working hours, the majority of participants, 393 (94.50%) reported working between 0–50 hours per week [Table 1].

The internal consistency of the musculoskeletal disorder scale and the K-10 Scale showed sufficient levels of reliability (Cronbach's alpha = 0.750 and 0.907, respectively, as presented in Table 2.

In Figure 1, we examined the presence of musculoskeletal disorders. Concerning the pain experienced over the past 12 months, a significant majority of participants, 294 (70.70%), reported experiencing pain. Among those who had encountered pain in both the last 12 months and the last 7 days, the majority, comprising 299 (71.90%), indicated that their pain had not interfered with their work. When we assessed the pain experienced in the last 7 days, it was evident that the majority of participants, specifically 228 (54.80%), had not experienced any pain during this time frame.

When participants were asked about specific body regions affected by pain, their responses were as follows: A significant proportion, 284 (68.30%), did not report any neck pain, and an even larger majority, 303 (72.80%), did not report any shoulder pain. The majority, constituting 377 (90.60%) participants, did

not report any elbow pain. Similarly, 341 (82.0%) participants did not report any wrist/hand pain. Concerning upper back pain, 305 (73.30%) participants did not report experiencing it. However, 209 (50.20%) participants did report experiencing low back pain. Conversely, the majority, 351 (84.40%) participants, did not report any hip/thigh pain. Furthermore, 322 (77.40%) participants did not report any knee pain. Lastly, 365 (87.70%) participants did not report any ankle/foot pain.

Table 1: Sociodemographic data (*n*=416)

Parameter	Category	*n*	%
Gender	Male	219	52.60%
	Female	197	47.40%
Study year	First year	88	21.20%
	Second year	65	15.60%
	Third year	64	15.40%
	Fourth year	65	15.60%
	Fifth year	68	16.30%
	Sixth year	66	15.90%
Are you a smoker?	No	377	90.60%
	Yes	39	9.40%
Marital status	Single	407	97.80%
	Married	9	2.20%
	Divorced	0	0.00%
	Widowed	0	0.00%
Do you have chronic diseases?	No	395	95.00%
	Yes	21	5.00%
Weight	49 or less	54	13.00%
	50–100	319	76.70%
	101 or more	43	10.30%
Height	140–170	261	62.70%
	171 or more	155	37.30%
Age	15–20	173	41.60%
	21–30	243	58.40%
Working hours	0–50	393	94.50%
	51–90	21	5.00%
	91 or more	2	0.50%

Table 2: Internal consistency (reliability analysis)

Parameter	*n* of items	Cronbach's alpha
Musculoskeletal disorder	12	0.750
The Kessler Psychological Distress Scale	10	0.907

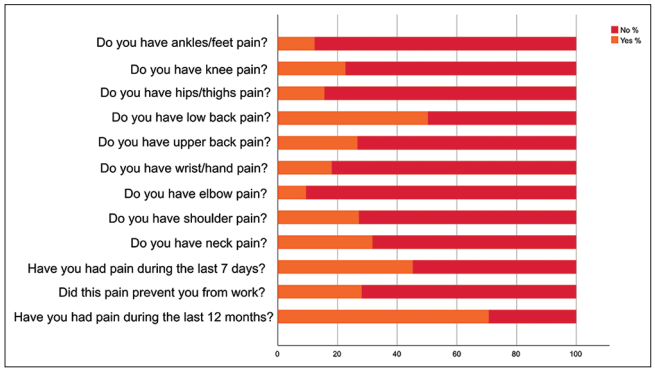

Figure 1: Responses related to musculoskeletal disorders

These findings offer valuable information about musculoskeletal pain prevalence and distribution among the study participants.

Figure 2 presents the frequency of feeling tired out for no good reason over the past 4 weeks among medical students. The majority of participants (37.50%) reported feeling tired some of the time. In terms of experiencing feelings of nervousness, participants were queried about their experiences over the past 4 weeks. The results revealed that (35.30%) of the medical students felt nervous most of the time. The study also explored the frequency of feeling so nervous that nothing could calm the students down over the past 4 weeks. Results showed that a significant number of students did not feel this way at all during the past 4 weeks (29.10%).

Regarding feelings of hopelessness, the results indicated that (26.90%) of the participants did not experience hopelessness. The study also investigated feelings of restlessness or fidgetiness among medical students over the past 4 weeks. The results showed that (31.70%) feet this way some of the time. Continuing to examine feelings of restlessness, the study assessed how often students felt so restless that they could not sit still over the past 4 weeks. Most participants (32.00%) reported that they did not feel this way.

The study further explored feelings of depression among medical students over the past 4 weeks. Results revealed that (30.50%) of the participants felt depressed most of the time. In terms of the frequency of feeling that everything was an effort over the past 4 weeks, most participants (28.80%) reported feeling this way most of the time. In addition, the study also examined feelings of sadness among medical students over the past 4 weeks. Results showed that 25.20% of the participants felt so sad that nothing could cheer them up a little of the time. Lastly, the study assessed feelings of worthlessness among medical students over the past 4 weeks. Most participants (42.80%) reported feeling worthless none of the time.

The relationship between musculoskeletal disorders and stress shows a moderate positive correlation, with a correlation coefficient of 0.489 and a *P* value of less than 0.001. To delve further into this relationship, we analyzed the variations

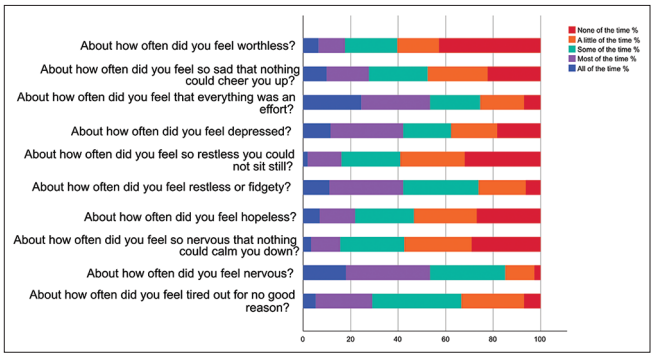

Figure 2: Frequency of feeling tired out for no good reason over the past 4 weeks

in MSD scores among medical students based on various sociodemographic factors, as depicted in Table 3.

Female students (median: 4.0, IQR: 2.0-6.0) had significantly higher scores of MSDs compared to male students (median: 3.0, IQR: 1.0-5.0, $P < 0.001$). Non-smoking students (median: 4.0, IQR: 2.0-5.0) had a higher median MSD score compared to smoking students (median: 2.0, IQR: 0.0-4.0, $P = 0.002$). Students with a weight of 49 or less (median: 5.0, IQR: 3.0-6.0) exhibited significantly higher scores of MSDs than those with a weight of 50–100 (median: 3.0, IQR: 1.0-5.0) or 101 or more (median: 4.0, IQR: 2.0-5.0, $P = 0.001$), and those with a height between 140–170 cm (median: 4.0, IQR: 2.0-6.0) showed a significantly higher median MSD score compared to those with a height of 171 cm or more (median: 3.0, IQR: 1.0-5.0, $P < 0.001$).

Regarding age, students aged 15–20 (median: 4.0, IQR: 2.0-6.0) had a significantly higher median of MSDs compared to those aged 21–30 (median: 4.0, IQR: 1.0-5.0, $P = 0.027$). Students who reported working between 51–90 hours (median: 6.0, IQR: 4.0-8.5) per week had a significantly higher MSD score than those who worked 0–50 hours (median: 4.0, IQR: 1.0-5.0) or 91 or more hours (median: 5.5, IQR: 5.0-NA, $P < 0.001$) per week [Table 3].

On the multivariable-adjusted regression analysis, no significant predictors were found for MSDs [Table 4].

Female medical students (median: 21.0, IQR: 14.0-26.0) exhibited significantly higher psychological distress compared to male medical students (median: 17.0, IQR: 9.0-22.0, $P < 0.001$). Furthermore, students with a height between 140–170 cm (median: 20.0, IQR: 13.0-25.0) showed significantly higher K10 scores compared to those with a height of 171 cm or more (median: 17.0, IQR: 9.0-23.0, $P = 0.005$). Other students' characteristics did not differ based on the psychological distress scores [Table 5].

Regarding the multivariable analysis, the beta coefficient for male students was −3.207, with a 95% confidence interval (CI) ranging from −5.090 to −1.324 compared to females. The *P* value for this association was highly statistically significant (*P* value = 0.001), indicating that male students were less likely to express psychological distress compared to female students [Table 6].

Table 3: Association between musculoskeletal disorders and sociodemographic data

Parameter	Category	Musculoskeletal disorder Median (IQR)	*P*
Gender	Male	3.0 (1.0-5.0)	<0.001
	Female	4.0 (2.0-6.0)	
Study year	First year	3.0 (1.0-6.0)	0.083
	Second year	4.0 (2.0-6.0)	
	Third year	4.0 (2.0-6.0)	
	Fourth year	3.0 (1.0-5.0)	
	Fifth year	4.0 (0.0-5.0)	
	Sixth year	4.0 (0.0-5.0)	
Are you a smoker?	No	4.0 (2.0-5.0)	0.002
	Yes	2.0 (0.0-4.0)	
Marital status	Single	4.0 (1.0-5.0)	0.159
	Married	3.0 (0.0-4.0)	
Do you have chronic diseases?	No	4.0 (1.0-5.0)	0.210
	Yes	4.0 (2.5-5.5)	
Weight	49 or less	5.0 (3.0-6.0)	0.001
	50-100	3.0 (1.0-5.0)	
	101 or more	4.0 (2.0-5.0)	
Height	140-170	4.0 (2.0-6.0)	<0.001
	171 or more	3.0 (1.0-5.0)	
Age	15-20	4.0 (2.0-6.0)	0.027
	21-30	4.0 (1.0-5.0)	
Working hours	0-50	4.0 (1.0-5.0)	<0.001
	51-90	6.0 (4.0-8.5)	
	91 or more	5.5 (5.0-NA)	

Table 4: Predictors of musculoskeletal disorders

Parameter	Category	Beta	95% CI		*P*
			LB	UB	
Gender	Male	−0.347	−0.948	0.255	0.258
	Female	Ref.	Ref.	Ref.	Ref.
Are you a smoker?	No	0.853	−0.030	1.735	0.058
	Yes	Ref.	Ref.	Ref.	Ref.
Weight	49 or less	0.132	−0.984	1.247	0.817
	50–100	−0.477	−1.304	0.351	0.258
	101 or more	Ref.	Ref.	Ref.	Ref.
Height	140–170	0.549	−0.055	1.153	0.075
	171 or more	Ref.	Ref.	Ref.	Ref.
Age	15–20	0.173	−0.359	0.705	0.522
	21–30	Ref.	Ref.	Ref.	Ref.
Working hours	0–50	−0.974	−4.544	2.596	0.592
	51–90	1.331	−2.359	5.022	0.479
	91 or more	Ref.	Ref.	Ref.	Ref.

Discussion

The study aimed to evaluate musculoskeletal disorder prevalence and its correlation with stress in medical students. The results provide valuable information into the physical and psychological well-being of this unique population and have implications for both healthcare providers and educational institutions.

In this study, we found that musculoskeletal disorder prevalence was high among College of Medicine students at Umm Al-Qura University, (70.70%) of the participants complained of pain in at least one site in the past 12 months. The most prevalent MSDs were low back pain (50.20%) followed by neck pain (31.70%) and shoulder pain (27.20%) within the past 12 months and the past week, but less frequently within the past week. Approximately a quarter of the participants (28.10%) reported that the pain prevents them from working, these results are similar to the results that were found by many other studies since more than 50% of the participating medical students had musculoskeletal disorders in the same locations that we mentioned above in our study.[8-11]

Table 5: The differences in Kessler Psychological Distress Scale score based on sociodemographic data

Parameter	Category	The Kessler Psychological Distress Scale Median (IQR)	*P*
Gender	Male	17.0 (9.0-22.0)	<0.001
	Female	21.0 (14.0-26.0)	
Study year	First year	17.5 (10.25-23.0)	0.483
	Second year	19.0 (9.5-24.0)	
	Third year	20.5 (14.5-26.0)	
	Fourth year	19.0 (9.0-25.5)	
	Fifth year	19.0 (11.25-23.0)	
	Sixth year	20.0 (9.0-23.25)	
Are you a smoker?	No	19.0 (10.0-24.0)	0.438
	Yes	18.0 (9.0-23.0)	
Marital status	Single	19.0 (10.0-24.0)	0.314
	Married	20.0 (9.5-20.0)	
Do you have chronic diseases?	No	19.0 (10.0-24.0)	0.498
	Yes	16.0 (8.0-24.5)	
Weight	49 or less	21.5 (16.0-24.5)	0.073
	50–100	19.0 (10.0-24.0)	
	101 or more	20.0 (11.0-26.0)	
Height	140–170	20.0 (13.0-25.0)	0.005
	171 or more	17.0 (9.0-23.0)	
Age	15–20	19.0 (12.0-24.0)	0.870
	21–30	20.0 (10.0-24.0)	
Working hours	0–50	19.0 (10.0-24.0)	0.200
	51–90	20.0 (19.0-29.5)	
	91 or more	20.5 (19.0-NA.)	

Table 6: Predictors of the Kessler Psychological Distress Scale

Parameter	Category	Beta	95% CI		*P*
			LB	UB	
Gender	Male	−3.207	−5.090	−1.324	0.001
	Female	Ref.	Ref.	Ref.	Ref.
Height	140–170	0.809	−1.136	2.753	0.414
	171 or more	Ref.	Ref.	Ref.	Ref.

We found that female gender was significantly associated with this high prevalence since female medical students (median: 4.0, IQR: 2.0-6.0) had significantly higher scores of musculoskeletal disorders compared to male medical students (median: 3.0, IQR: 1.0-5.0, $P < 0.001$), which is similar to the findings from several other studies.[8-10]

Students with a weight of 49 kg or less (median: 5.0, IQR: 3.0-6.0) exhibited significantly higher scores of MSDs than those with a weight of 50–100 kg (median: 3.0, IQR: 1.0-5.0) or 101 or more kg (median: 4.0, IQR: 2.0-5.0, $P = 0.001$), and those with a height between 140–170 cm (median: 4.0, IQR: 2.0-6.0) showed a significantly higher median MSD score compared to those with a height of 171 cm or more (median: 3.0, IQR: 1.0-5.0, $P < 0.001$), This conflicts with other studies which suggest that body mass index is a risk factor because prevalence of musculoskeletal disorders was higher among students with high body mass index.[12,13] There are studies reported that musculoskeletal disorders were significantly associated with normal body mass index ($P < 0.010$).[14,15]

Psychological stress prevalence is known to be high among students in colleges of medicine because of their lifestyle and academic pressure, which results in more psychological stress compared to students from other colleges and the general population.[4,16,17] We found that female medical students (median: 21.0, IQR: 14.0-26.0) exhibited significantly higher psychological distress compared to male medical students (median: 17.0, IQR: 9.0-22.0, $P < 0.001$). Other studies found that females have a higher risk than males which is consistent with our findings.[4,16] Other students' characteristics like study year, marital status, smoking, and working hours did not differ based on the psychological distress scores. Nevertheless, some studies found a link between the level of study and stress,[16] but we did not find an association between them ($P = 0.178$).

Other studies found a significant association between psychological stress and musculoskeletal disorders,[12,14,18] which is consistent with our study. The onset and appearance of musculoskeletal disorders might be affected by multiple factors, such as gender, physical activity, job demand, and psychosocial stress rather than one single factor.[4,12,19]

While this study contributes valuable insights into musculoskeletal disorders prevalence and their correlation with stress in medical students, it is important to acknowledge several limitations that may impact the interpretation of the findings and guide future research in this area.

The study focused on the college of medicine students at Umm Al-Qura University, which may limit the generalizability of the results to other medical schools or regions. Different educational environments, curriculum structures, and cultural contexts could yield varying results. The study's reliance on voluntary participation may introduce selection bias. Participants who chose to take part in the survey may have different characteristics or experiences compared to non-participants, potentially affecting the generalizability of the results.

The Results of this study have several implications. First, healthcare providers and educators should recognize the musculoskeletal disorders and stress prevalence among medical students and consider implementing preventive measures and support systems. Ergonomic education, physical activity promotion, and stress management programs can contribute to better physical and mental well-being among students.

Second, further research is warranted to explore the exact mechanisms behind the correlation between musculoskeletal disorders and stress in medical students. Longitudinal studies could provide insights into the causal relationships and potential mediators.

Conclusions

In conclusion, this cross-sectional survey sheds light on musculoskeletal disorders prevalence and their correlation with stress in medical students. Musculoskeletal disorders are considered a common health problem among medical students with significant association with many factors such as female gender and body mass index. Psychological stress is also a common problem among college medicine students because their lifestyle is more demanding. Even though MSDs affected (70.70%) of the participants in our study, this was not related to study year or working hours. Warning levels of musculoskeletal disorders and high levels of psychological stress require more attention, care management, and most importantly prevention. It underscores the importance of holistic healthcare for medical students. It emphasizes the need for targeted interventions to promote their well-being as they embark on their journey to become healthcare professionals.

Ethical considerations

This study received Umm Al-Qura University Research Ethics Committee approval (HAPO-02-K-012-2023-04-1561).

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Conflicts of interest

There are no conflicts of interest.

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