

Review

Assessment of the Attitudes and Knowledge of Musculoskeletal Medicine Among Medical Students at King Faisal University: A Cross-Sectional Study

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Abstract

Background: Musculoskeletal conditions are a frequent reason for seeking medical attention. In the United States and Canada, orthopedic injuries constitute about 15-30% of primary care visits. Physicians from various specialties encounter musculoskeletal conditions and manage both, acute and chronic problems, on a daily basis. Considering this, mastery of the fundamentals of musculoskeletal medicine is required for all medical school graduates. In this study, we aim to evaluate the attitudes and knowledge of musculoskeletal medicine among medical students at King Faisal University.

Methodology: A cross-sectional study with one-stage sampling technique was conducted among medical students at King Faisal University from February 2021 to May 2021.

Results: Our study demonstrated that students possess a lower level of clinical confidence in their ability to perform musculoskeletal clinical examinations compared to pulmonary clinical examinations. Further, they displayed a lower level of clinical confidence in their ability to make musculoskeletal differential diagnoses compared to pulmonary differential diagnoses. Also, their average scores on the basic competency exam did not reach 73.1.

Conclusion: The current study evaluated the attitudes and knowledge of musculoskeletal medicine among medical students at King Faisal University. The findings in our study are consistent with the results of other research that indicate medical students are not getting sufficient education in musculoskeletal medicine.

Keywords: clinical confidence, musculoskeletal medicine, medical students, medical education.

Introduction

Musculoskeletal conditions are a frequent cause for seeking medical care (1). In the United States and Canada, orthopedic injuries constitute about 15-30% of primary care visits (2). In Saudi Arabia, orthopaedic complaints are the third most common reason for emergency department visits (3). Physicians from various specialties encounter musculoskeletal conditions and manage both, acute and chronic problems, on a daily basis. Keeping this into consideration, mastery of the fundamentals of musculoskeletal medicine is required for all medical school graduates (4). To emphasize the importance of musculoskeletal medicine and the need for proper knowledge and training in this field, the World Health Organisation designated the years 2000 to 2010 as the Bone and Joint Decade (5). As part of this effort, recent emphasis has been placed on the responsibility of undergraduate medical institutions in promoting effective musculoskeletal education. In 2005, the Association of American Medical Colleges (AAMC) reported that it was unclear whether undergraduate musculoskeletal programs in medical schools were sufficient to provide effective education (6). A study conducted at Harvard Medical School during the 2005-2006 academic year demonstrated that students had poor cognitive mastery, low clinical confidence, and were dissatisfied with the time devoted to musculoskeletal education (7). A cross-sectional study that evaluated knowledge of musculoskeletal medicine among physicians and physical therapists in Saudi Arabia showed that there is inadequate knowledge of musculoskeletal medicine among primary care physicians and physical therapists (8). A review of previous research on the competency in musculoskeletal education in medical schools showed that there is clear evidence that undergraduate medical programs do not adequately prepare future physicians in musculoskeletal medicine (7, 9-11). Considering the importance of musculoskeletal medicine for physicians, a proper assessment of the basic knowledge regarding musculoskeletal conditions among undergraduate students needs to be addressed. Therefore, in this study, we aim to assess the attitudes and knowledge of musculoskeletal medicine among medical students at King Faisal University.

Methodology

We conducted a cross-sectional study with a single stage sampling technique among medical students at King Faisal University. An anonymous pre-structured questionnaire was offered to third, fourth-, and fifth-year

medical students between February 2021 to May 2021 from a previously validated survey (12). We excluded first and second year medical students at King Faisal University as well as medical students outside King Faisal University. The survey began with two questions regarding gender and year in the college of medicine. Then, all the participants were asked to complete a 29-question survey that included students' perceptions regarding the importance they place on musculoskeletal education, how confident they are in performing musculoskeletal physical examinations, and their assessment of the time spent on musculoskeletal pathophysiology and medicine. Freedman and Bernstein's basic musculoskeletal competency exam was used to examine students' cognitive mastery of musculoskeletal medicine.

Statistical Analysis

Data were coded, validated, and analysed using the SPSS software package version 21. Frequency and percentages were used to report categorical variables. A Chi-square test was used to assess the presence of association. The level of significance was set at 0.05.

Results

Table 1 shows that out of 300 medical students who completed the questionnaire, 140 (46.7%) were males and 160 (53.3%) were females. Most of them were in the fourth academic year (108, 36%), followed by the fifth year (100, 33.3%), and lastly in the third year (92, 30.7%) (**Table 1, Figure 1, 2**).

Table 1. Sociodemographic characteristics of the study participants (n=300)		
Sociodemographic data	Number (n)	%
Gender		
<i>Male</i>	140	46.7%
<i>Female</i>	160	53.3%
Academic year		
<i>3rd year</i>	92	30.7%
<i>4th year</i>	108	36.0%
<i>5th year</i>	100	33.3%

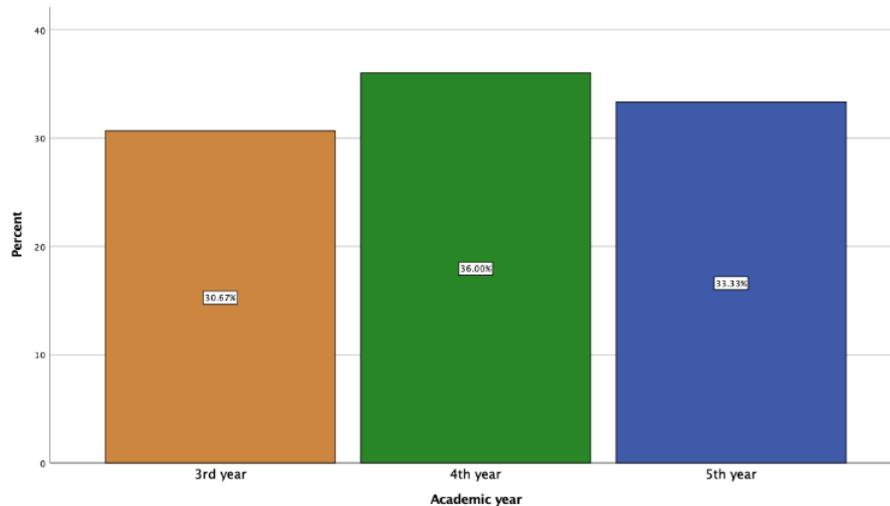


Figure 1: Academic year distribution of the study participants ($p=300$)

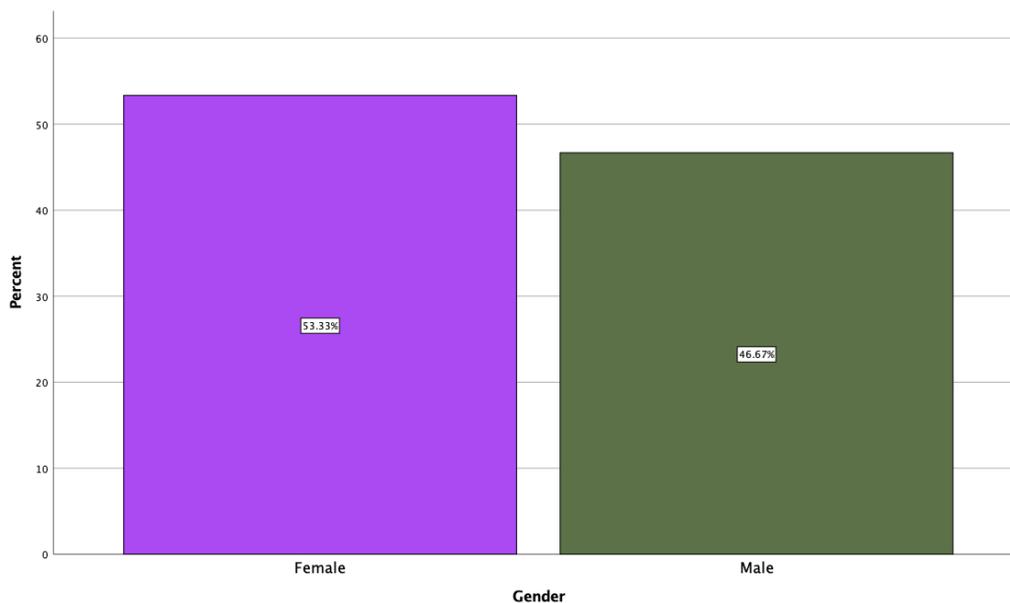


Figure 2: Gender distribution of the study participants ($p=300$)

Table 2 compares the clinical confidence levels among this cohort in performing a musculoskeletal physical examination and pulmonary physical examination. The data reveals a greater proportion of ‘adequate’ to ‘high’ clinical confidence levels of students in performing a pulmonary physical examination (262, 87.4%) compared to a musculoskeletal physical examination, for which the cohort showed a greater proportion of ‘no’ to ‘low’ clinical confidence levels (169, 56.3%). Also, participants displayed a greater proportion of ‘adequate’ to ‘high’ clinical confidence levels in numerating

pulmonary system differential diagnoses (246, 82%) compared to a greater proportion of ‘no’ to ‘low’ clinical confidence levels in numerating musculoskeletal differential diagnoses (219, 73%). With regards to performing physical examinations, all students across all academic years had significantly different clinical confidence levels in case of pulmonary physical examination (p -value = 0.001). However, only the fifth-year students had significant differences among their clinical confidence levels in performing a musculoskeletal physical examination.

Table 2. Comparison of students' clinical confidence levels in performing tasks related to musculoskeletal system and pulmonary system

Clinical confidence levels in performing tasks	High	Adequate	Low	Nil
	n (%)	n (%)	n (%)	n (%)
How confident you are when performing a musculoskeletal physical examination? Levels range from zero to complete confidence	21 (7%)	110 (36.7%)	157 (52.3%)	12 (4%)
How confident you are when performing a pulmonary physical examination? Levels range from zero to complete confidence	113 (37.7%)	149 (49.7%)	36 (12%)	2 (0.7%)
How confident you are in enumerating appropriate differential diagnoses in musculoskeletal system? Levels range from zero to complete confidence	22 (7.3%)	59 (19.7%)	166 (55.3%)	53 (17.7%)
How confident you are in enumerating appropriate differential diagnoses in pulmonary system? Levels range from zero to complete confidence	100 (33.3%)	146 (48.7%)	50 (16.7%)	4 (1.3%)

Regarding the relation between the academic year and clinical confidence levels in enumerating differential diagnoses, third year students had significantly different 'no' to 'low' clinical confidence levels in enumerating musculoskeletal differential diagnoses (p-value <0.001) compared to their colleagues. Among the fifth-year medical students, differences among the three clinical confidence levels in enumerating differential diagnoses in the pulmonary system were statistically significant (p-value <0.001). In terms of gender differences, females had significantly greater clinical confidence levels in performing pulmonary physical examination compared to their male colleagues (p-value = 0.037). Insignificant differences between males and females were observed with respect to clinical confidence levels in enumerating differential diagnoses, in both, pulmonary and musculoskeletal systems.

Table 3 represents students' perception of the importance of the musculoskeletal education in comparison with pulmonology education towards their future medical career. It indicates that more students think that pulmonology education (81.7%) is more important than the musculoskeletal education in their future medical career (53.7%). **Table 4** represents an assessment of the time spent on musculoskeletal pathophysiology and medicine. It is clearly shown that more students think that time spent on musculoskeletal education is inadequate 115 (38.3%). **Table 5** represents the number of correct and incorrect responses by the cohort on Freedman and Bernstein's basic competency examination in musculoskeletal medicine. The questions are categorized into core knowledge questions and case scenarios.

Table 3. Students' perception of the importance of the musculoskeletal education in comparison with pulmonology education towards their future medical career

Importance	No importance	Low importance	Moderate importance	High importance	Very high importance
	n (%)	n (%)	n (%)	n (%)	n (%)
How important do you think musculoskeletal education is towards your future medical career?	8 (2.7%)	56 (18.7%)	75 (25%)	110 (36.7%)	51 (17%)
How important do you think pulmonology education is towards your future medical career?	3 (1%)	13 (4.3%)	40 (13.3%)	132 (44%)	112 (37.3%)

Table 4. Students' assessment of the time spent on musculoskeletal pathophysiology and medicine

Adequacy	None	Inadequate	Adequate	Good	Excellent
	n (%)	n (%)	n (%)	n (%)	n (%)
Rate the time spent on musculoskeletal pathophysiology and medicine	37 (12.6%)	115 (38.3%)	87 (29.3%)	48 (16.3%)	10 (3.3%)

Table 5. Correct and incorrect student responses on the Freedman and Bernstein's basic competency examination

Basic competency examination in musculoskeletal medicine	Correct	Incorrect
	n (%)	n (%)
Core knowledge		
What common problem must all newborns be examined for?	228 (76%)	72 (24%)
What is compartment syndrome?	247 (82.3%)	53 (17.7%)
Acute septic arthritis of the knee may be differentiated from inflammatory arthritis by which laboratory test?	194 (64.7%)	106 (35.3%)
How is compartment syndrome treated?	232 (77.3%)	68 (22.7%)
What nerve is compressed in carpal tunnel syndrome?	271 (90.3%)	29 (9.7%)
How is the motor function of the median nerve tested in the hand?	119 (39.7%)	181 (60.3%)
What are the five common sources of cancer metastasis to the bone?	239 (79.7%)	61 (20.3%)
Name two differences between rheumatoid arthritis and osteoarthritis?	241 (80.3%)	59 (19.7%)
What malignancy may be present in bone yet typically is not detected on the bone scan?	55 (18.3%)	245 (81.7%)

What is the function of the normal anterior cruciate ligament of the knee?	229 (76.3%)	71 (23.7)
What is the difference between osteoporosis and osteomalacia?	195 (65%)	105 (35%)
In elderly patients, displaced fractures of the neck of femur are typically treated by joint replacement, whereas fractures of the trochanter are treated by plate and screws. Why?	84 (28%)	216 (72%)
What muscle/s is/are involved in lateral epicondylitis?	87 (29%)	213 (71%)
Rupture of the biceps at the elbow results in weakness of both elbow flexion and?	125 (41.7%)	175 (58.3%)
What muscle(s) control(s) external rotation of the humerus with the arm by the side?	103 (34.3%)	197 (65.7%)
Case scenarios		
A patient dislocates his knee in a car accident. What structure/s is/are at risk for injury and therefore must be evaluated?	61 (20.3%)	239 (79.7%)
A patient punches his companion in the face and sustains a fracture of the 5th metacarpal and a 3-mm break in skin over the fracture. What is the correct treatment and why?	159 (53%)	141 (47%)
A patient comes to the office complaining of low-back pain that wakes him from sleep. What two diagnoses are you concerned about?	258 (86%)	42 (14%)
A patient lands on his hand and is tender to palpation in the snuff box (the space between the thumb extensor and the adductor tendons). Initial radiographs do not show a fracture. What diagnosis must be considered?	109 (36.3%)	191 (63.7%)
A 25-year-old male is involved in a motor vehicle accident. His left limb is in a position of flexion at the hip and knee with internal rotation and adduction at the hip. What is the most likely diagnosis?	157 (52.3%)	143 (47.7%)
A patient has a disc herniation pressing the 5th lumbar nerve root. How is the motor function of the fifth lumbar root tested?	79 (26.3%)	221 (73.7%)
A 12-year-old boy severely twists his ankle. Radiographs show only a soft tissue swelling. He is tender at the distal aspect of the fibula. What are the two possible diagnoses?	170 (56.7%)	130 (43.3%)
A patient presents with new onset low back pain. Under what conditions are plain radiographs indicated? Please name five (example: history of trauma)	273 (91%)	27 (9%)
A patient has a displaced fracture near the fibular neck. What structure is at risk for injury?	130 (43.3%)	170 (56.7%)
A 20-year-old injures his knee while playing football. You see him on the same day, and he has a knee effusion. An aspiration shows frank blood. What are the three common diagnoses?	272 (90.7%)	28 (9.3%)

Table 6 demonstrates a significant difference between the male and female students with respect to possession of adequate information in the basic competency examination in musculoskeletal medicine, with male students faring better (p -value = 0.045). Also, the different academic years showed a significant difference among themselves with regards to their test

performances. No third-year students had adequate information at all, compared to their colleagues in the fourth year and fifth year students, some of whom did have adequate information (p -value < 0.001), with fifth year medical students faring better among the two academic year groups. Overall, inadequacy was common among all medical years (**Figure 3**).

Table 6. Knowledge of the participants based on the Freedman and Bernstein's basic competency examination

Does the participant have adequate information regarding musculoskeletal medicine?	Adequate information (n)	Inadequate information (n)	<i>p-value</i>
Gender			
<i>Male</i>	26	114	0.045*
<i>Female</i>	16	144	
Academic year			
<i>3rd year</i>	0	92	<0.001*
<i>4th year</i>	14	94	
<i>5th year</i>	28	72	

* *P-value* <0.05 statistically significant

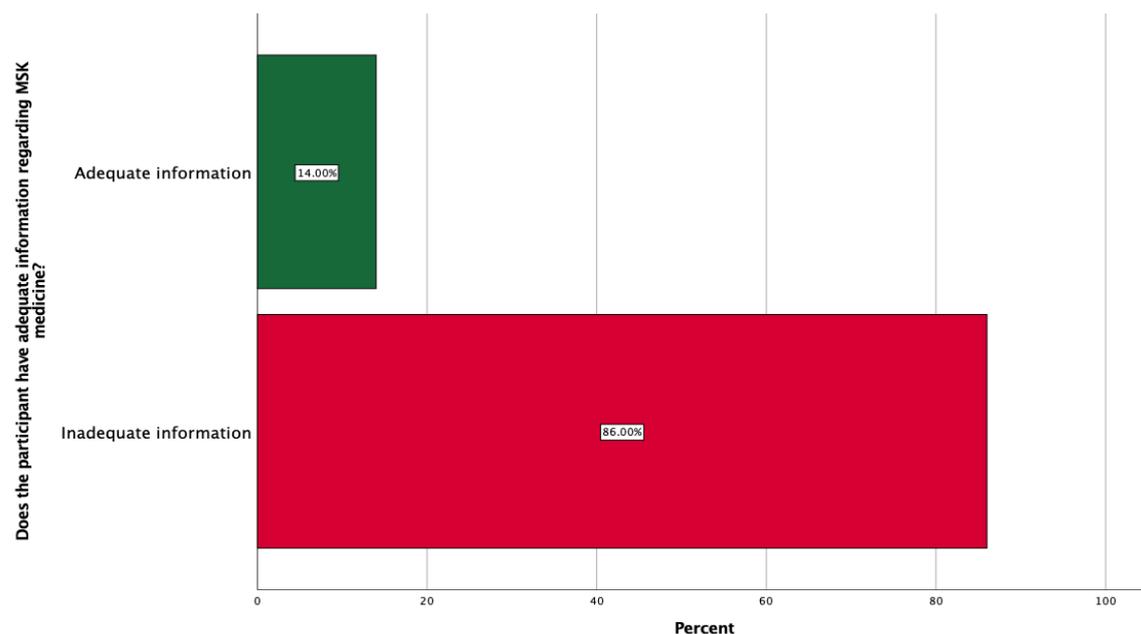


Figure 3: Knowledge of the participants based on the Freedman and Bernstein's basic competency examination (MSK=musculoskeletal)

Discussion

The present study assessed the knowledge and attitude of medical students at King Faisal University in relation to musculoskeletal medicine. Musculoskeletal pain related complaints are among the most commonly encountered pain in healthcare settings. In fact, it accounts for the biggest cause of disability in many countries, such as the United States and United Kingdom. It was estimated to be one of the main three causes for the global burden of non-communicable diseases in 2016, accounting for roughly 16% of all disability adjusted life-years (DALYs) (13). It is, therefore, very clear that basic

knowledge of musculoskeletal medicine is essential for all healthcare providers, especially for physicians working in specialties that encounter a high flow of patients with musculoskeletal complaints, such as emergency medicine, pediatrics, family medicine, and internal medicine.

Students' self-perceived clinical confidence in performing pulmonary and musculoskeletal system related tasks

In our study, students considered musculoskeletal education to be of high importance for their future

careers. However, they felt that the time devoted to musculoskeletal education was insufficient. This is also suggested from the students' answers regarding their clinical confidence in performing pulmonary and musculoskeletal physical examinations and their confidence in making pulmonary and musculoskeletal differential diagnoses. More students displayed zero to low clinical confidence levels in performing musculoskeletal physical examinations (169, 56.3%) when compared with pulmonary physical examinations (38, 12.7%). Also, they indicated having relatively low clinical confidence levels in making musculoskeletal differential diagnoses (219, 73%) when compared with pulmonology differential diagnoses (54, 18%). This mirrors the reflections of the Harvard study where the same students who felt a high level of confidence in examining the pulmonary system felt low to average levels of confidence in performing a musculoskeletal examination (7). Likewise, the self-reported confidence of students in enumerating differential diagnoses pertaining to the pulmonary problems was significantly higher than their perceived confidence in generating musculoskeletal differential diagnoses (7).

Students' perception of the importance of the musculoskeletal education

More students perceived pulmonary system education as more important than musculoskeletal system education. This is consistent with another study which reported that medical students, overall, hold musculoskeletal education as less important, when compared to other systems, such as renal education (14). It is important to note that this is a generalization; students with interest in orthopedics have shown to rate musculoskeletal education much higher than students with career interest in internal medicine and family medicine. The above-mentioned study reported that such students on average rated musculoskeletal education as the fifth most important component of their medical curriculum. Interestingly, osteopathic medicine students perceived musculoskeletal education of higher importance compared to allopathic students (14, 15).

Students' assessment of the time spent on musculoskeletal pathophysiology and medicine

Further, the students acknowledged an inadequacy of learning opportunities. For instance, with respect to the exposure to musculoskeletal medicine during clinical years, the majority of students felt that the time spent on musculoskeletal pathophysiology and medicine was adequate or less than adequate (239, 80.2%). A report

from a similar study conducted at University of California, Irvine found the overall mean satisfaction score in regard to quantity and quality, as defined in their questionnaire, to be 2.3/5 and 2.4/5, respectively (16). A similar finding was reported in the survey conducted by the Steering Committee on Collaboration among Physician Providers Involved in Musculoskeletal Care in the US among second-year allopathic and osteopathic residents questioned about preparedness for dealing with musculoskeletal problems on graduation from medical school (9). When asked, "On entering residency, how would you describe your preparation/training to conduct a musculoskeletal examination to assess problems of various areas of the body," a high proportion of the residents admitted feeling poorly or very poorly prepared in most topics (9). We feel that the deficiency recognized by students is a matter of concern and would require not only increased curricular and clinical exposure to musculoskeletal medicine but also incorporation of high-yield teaching methods.

Students' knowledge of musculoskeletal medicine

Moreover, most of the students' scores on Freedman and Bernstein's basic competency exam did not reach the passing score of 73.1 (n=268), showing a defect in students' knowledge of musculoskeletal medicine. This result is consistent with another study that was conducted among medical students at Harvard Medical School, which showed that the majority of the participants had inadequate knowledge as determined by the basic competency exam (7). Similar results are seen in another study which showed that student participants had a passing rate of only 67 (19.3%) out of 348 (7, 17). In the same study, it was observed that students who had taken elective courses related to musculoskeletal medicine were able to deliver a significantly better performance on the competency test compared to those who had covered only the required curriculum (7). This indicates the paucity of coverage assigned to musculoskeletal medicine in the medical, and points to the benefit of increased attention to the subject in the future.

Gender based comparison demonstrated that a higher number of males had adequate information in the basic competency examination in musculoskeletal medicine (p-value = 0.045) compared to female students. Interest of the student may reflect positively or negatively on the knowledge and performance in that specific subject or specialty. This could partly explain why we tend to see more males apply to orthopedics than females. However, it can be argued that this is not a universal phenomenon. A study from the United Kingdom found that female

undergraduate medical students tended to have lower clinical confidence than their male counterparts, rather than lower competence (18). They concluded that competence is more likely to reflect confidence in female students rather than male students.

Also, comparison between the academic years shows that there is a significant difference between the academic levels showing that third year students had no adequate information at all compared to their colleagues in the fourth year and fifth year, which showed more participants with adequate information (p -value < 0.001), with slight superiority in the hand of fifth year medical students. The difference in the academic level is reasonable, the low performance of third year students could be reasoned by their lack of exposure as they experienced their orthopedic clerkship for the first time in their medical education this year. Also, the difference between fourth year and fifth year students is reasonable as well, as fifth year students had more exposure and clinical education in orthopedics.

The high prevalence of musculoskeletal complaints among patients necessitates the provision of adequate knowledge of musculoskeletal medicine to medical students. In the past, multiple studies have concluded that insufficient exposure to musculoskeletal medicine during medical school may result in primary care providers from a variety of disciplines feeling unprepared to assess musculoskeletal diseases (19-22). Residents of internal medicine have reported having insufficient education and training in musculoskeletal medicine both in their undergraduate and post graduate programs and there is a consensus amongst the academic medicine community on the necessity of having an integrated program focused on training and education in the musculoskeletal medicine (23). The findings in our study are consistent with the results of other studies that indicate medical students are not getting sufficient education in musculoskeletal medicine (4, 7, 24). Thus, a thorough review of the musculoskeletal program at our institution should be considered. We suggest creating a five-year integrated musculoskeletal program with a regular assessment to ensure the effectiveness of the implemented program.

Our assessment was carried out at only one medical school, and it may not be representative of other medical institutions as the medical curriculum including musculoskeletal medicine curriculum varies from institution to institution.

Conclusion

Medical students are not getting sufficient education in musculoskeletal medicine. Our study demonstrates that students possess relatively low clinical confidence in their ability to perform musculoskeletal system related tasks such as conducting physical examinations and generating differential diagnoses when compared with their clinical confidence in performing the same tasks in relation to the pulmonary system. Further, students' scores on the basic competency exam did not reach the passing score of 73.1.

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Disclosure

Statement

The authors declare that there is no conflict of interest.

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Ethical considerations

Ethical approval was obtained from the ethical committee of the College of Medicine, King Faisal University. The reference number is KFU-REC-2022-MAY-ETHICS22.

Data availability

All data used are available in this article and the survey is in the supplementary materials

Authors' contributions

All authors of this study participated equally in manuscript writing, data collection, data analysis, proofreading and publication.

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