Levels of Physical Activity and Prevalence of Musculoskeletal Disorders Among Physicians in Saudi Arabia Post COVID-19 Lockdown: An Epidemiological Cross-Sectional Analysis

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Abstract

Introduction: Musculoskeletal disorders (MSDs) are common worldwide. Recommendations to reduce discomfort often commence with increasing physical activity levels. In Saudi Arabia, levels of physical activity prior to the COVID-19 pandemic were low. This cross-sectional study aims at estimating the prevalence of MSDs among Saudi physicians, as well as determining the pattern and level of physical activity post lockdown and examining their association. **Methods:** Physical activity levels were assessed via the International Physical Activity Questionnaire and MSDs were assessed via the Nordic Musculoskeletal Questionnaire. Chi-squared tests with significance levels of $<.05$ were performed to explore bivariate associations. Unadjusted and adjusted odds ratios (ORs) along with their 95% confidence intervals (CIs) were given by binary logistic regression analyses. **Results:** A total of 3492 physicians participated in this study, and over half of them (63.55%) reported low physical activity. Risk of MSDs increased with aging and with increasing BMI (P for trend $<.05$). Females were more likely to report MSDs (OR = 1.23, 95% CI = 1.07-1.86), as well as physicians with a chronic condition (OR = 1.52, 95% CI = 1.24-1.37) and those who work in shifts (OR = 1.18, 95% CI = 1.03-1.37). Moderate activity conferred a non-significant protective effect (OR = 0.95, 95% CI = 0.79-1.13), whilst high physical activity had a non-significant increased risk of MSDs in this population. **Conclusion:** Physical activity in this population is astonishingly low, while prevalence of MSDs is relatively high. Significant factors include age, sex, shift work, and the presence of chronic conditions. Current results warrant the consideration of preventive measures for physicians.

Keywords

physical activity, musculoskeletal disorders, epidemiology, Saudi Arabia

Introduction

Musculoskeletal disorders (MSDs), which may be defined as self-reported musculoskeletal symptoms, are common and can have detrimental individual effects as well as negative economic effects on the community.[1] The Global Burden of Disease study in 2016 has identified low back pain as the leading cause of years of life lost due to disability. It also found that neck pain and other musculoskeletal conditions are regarded as the sixth and seventh leading causes.[2]

A combination of factors is thought to cause MSDs, which range between individual, psychological, and work-related factors. Physicians are prone to MSDs due to the strenuous physical and psychosocial working conditions which may include manual handling, work schedule or shift work, heavy workload, and stress.[3] Such working conditions may be exacerbated due to the COVID-19 pandemic.

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In Saudi Arabia, a limited number of research was carried out on specific health workers to estimate the prevalence of MSDs. For example, among radiologists, 88.9% reported MSDs during the 12-months preceding the study in at least 1 body region, whereas a prevalence of 77.9% was reported for dentists.[4,5]

Physical activity is recommended as a preventive measure for several physical and mental conditions, including MSDs, and is considered as an independent predictor for successful healthy aging.[6,7] According to a systematic review of Saudi studies conducted prior to the pandemic, physical activity levels remain low due to reasons which may include but are not limited to lack of time, interest, social support, and resources especially among females.[8] Since the evidence shows that the prevalence of MSDs increases with age, special attention should be given to their association with physical activity among middle aged and older professionals.[9] This is especially important in professionally active individuals, specifically those who are already at a higher risk due to the nature of their work.

In Saudi Arabia, previous research has examined MSDs specifically, but none has examined the effect of physical activity on a large sample of physicians during the current pandemic. Saudi Arabia was one of the first countries to implement precautionary measures to mitigate the impact of COVID-19. In fact, such measures were implemented prior to the detection of the first case on March 2nd, 2020.[10] Such measures included the shift towards a complete online teaching model, hence schools, shopping malls, and fitness centers were all on lockdown.

Therefore, this study aims at estimating the prevalence of MSDs among Saudi physicians, as well as quantifying the pattern of physical activity levels during the pandemic using validated tools. Furthermore, to determine whether physical activity as well as other sociodemographic factors contribute to the MSD risk in this highly important group.

Methods

Participants and Study Design

This cross-sectional study was performed on Saudi physicians from a wide range of specialties (medical and surgical) across Saudi Arabia during May 2021 after the opening of fitness centers following the second lockdown which ended on the 6th of March. The study protocol was approved by the Institutional Review Board of Imam Abdulrahman Bin Faisal University. Written informed consent was obtained from the participants and the study was performed according to the relevant guidelines.

Physicians of both genders were invited to participate in the study. The minimum required sample size was calculated to be 1651 while assuming a prevalence of 77.9% of MSDs,[5] and given a precision of 2%, and at an alpha level of .05. The Epi info 7.0 software (CDC, Atlanta, USA) was used to compute the sample size.

The data was collected by an online self-administered questionnaire that was based on 2 validated tools. The online link of the survey was distributed to physicians through their registered emails within the Saudi Commission for Health Specialities. To avoid any duplication of responses, the link did not accept multiple responses from the same participant.

Data Collection Tool

Exposure variables. The proposed risk factors were determined based on a search of the literature focusing on MSDs and demographics. Participating physicians were asked basic sociodemographic questions including, age (25 < 35, 35 < 45, 45 < 55, and 55-65 years), sex, and marital status. Other questions regarding work included professional rank, years of experience (<1, 1 < 5, 5 < 10, 10 < 15, 15 < 20, and >20 years), and shift work (Yes/No). Health related questions included height and weight, which were used to compute the body mass index (BMI). The questionnaire also included the presence of chronic conditions and whether participants own a valid gym membership.

Physical activity levels were assessed via the use of the International Physical Activity Questionnaire short form (IPAQ).[11] It is a validated and useful tool to assess habitual physical activity levels. The tool consists of 6 items estimating exercise frequency and duration and includes 1 item that measures sedentary behaviour. The 6 items involve the following indexes: walking, and moderate and vigorous physical activity, which are then summed to compute total physical activity. The final categories of physical activity levels are given as low, moderate, and high according to the IPAQ criteria.[11]

Outcome variables. The standard Nordic Musculoskeletal Questionnaire was used to determine which body regions were affected by MSDs.[1] It is a valid and reliable screening and surveillance tool that is made up of questions on ache, pain, or discomfort during the last 7 days and the last 12 months. It also includes questions on whether these troubles have prevented the participant from performing normal activities. The tool focuses on the neck, shoulders, elbows, wrists/hands, upper back, lower back, hips/thighs/buttocks, knees, and ankles. Similar to other studies and to allow for comparisons, the outcome used for this study was the presence of MSDs in any of the 9 body regions which have restricted the participants from performing normal activities within the last 12 months. The responses of the outcome variables were dichotomized so that a response of "yes" in any body region was coded as "yes", whereas a participant who indicated a "no" response to all body regions was coded as "no."

Statistical Analysis

Data were analyzed using the Stata software Version 15 (StataCorp, TX, USA). Descriptive statistics were presented as frequencies and percentages. Bivariate associations were explored by the Chi-squared tests, followed by bivariate and multivariable logistic regression analyses to present unadjusted and adjusted odds ratios (ORs) along with 95% confidence intervals (CIs). Candidate variables for multivariable analyses were selected based on the risk factors identified in the literature and were not solely based on bivariate analyses results. Some significant variables in the bivariate analyses were not included in the multivariable model to avoid multicollinearity. Model fit diagnostics were performed to determine the best model fit.

Results

Characteristics of the Physicians

A total of 3492 physicians participated in the study. It included 1885 (53.98%) males and 1607 (46.02%) females. Overall, 2267 (64.93%) were physicians belonging to the 25 < 35 years age group. Residents made up most of the respondents accounting for 37.29%. Also, 2232 (63.92%) were in medical specialities and over half the respondents did not work in shifts (55.27%). Only 806 (23.08%) had a gym membership. In total, 544 (15.58%) physicians were obese and 2219 (63.55%) were in the low physical activity category (Table 1).

Musculoskeletal Disorders Among the Physicians

Among all respondents, 44.59% reported MSDs in at least 1 region of the body during the 7 days preceding the study. Over half the respondents (66.81%) reported symptoms in at least 1 body region within the last 12 months with 34.56% being prevented from performing normal activities due to those symptoms (Table 2).

The symptoms varied across the different body regions. The lower back region was the most reported area both in the 7 days and the 12 months preceding the study (23.02% and 42.44% respectively). It was also the most mentioned region of symptoms in the past 12 months preventing participants from carrying out normal activities (17.64%).

Factors Related to Musculoskeletal Disorders According to Bivariate Analyses

The MSDs that have restricted a participant's ability to perform normal activities within the past 12 months were associated with several factors at the bivariate analyses level (Table 3). The rate of MSDs was found to increase with increasing age groups, where the most common age group reporting MSDs was the 55 < 65-year-olds (45.61%).

Table 1. Sociodemographic and work characteristics.

Characteristics	Total N (%) 3492 (100.00)
Age	
25 < 35	2267 (64.93)
35 < 45	733 (20.99)
45 < 55	378 (10.82)
55 < 65	114 (03.26)
Sex	
Males	1885 (53.98)
Females	1607 (46.02)
Chronic conditions	
No	3017 (86.40)
Yes	475 (13.60)
Professional rank	
Service	868 (24.86)
Resident	1302 (37.29)
Specialist	768 (21.99)
Consultant	554 (15.86)
Years of practice	
<1	741 (21.22)
1 < 5	1267 (36.28)
5 < 10	668 (19.13)
10 < 15	413 (11.83)
15 < 20	196 (05.61)
>20	207 (05.93)
Type of speciality	
Medical	2232 (63.92)
Surgical	1260 (36.08)
Working in shifts	
Yes	1562 (44.73)
No	1930 (55.27)
Have a gym a membership	
Yes	806 (23.08)
No	2686 (76.92)
Body Mass Index	
Underweight	164 (04.70)
Normal weight	1571 (44.99)
Overweight	1213 (34.74)
Obese	544 (15.58)
Physical activity	
Low	2219 (63.55)
Moderate	757 (21.68)
High	516 (14.78)

Females and physicians who had chronic conditions also had high MSD rates compared to their counterparts (36.28% and 32.91% respectively), both of which were statistically significant. Similar to age, the rate of MSDs increased with increasing BMI. However, this was not statistically significant. Years of practice were significantly associated the presence of MSDs but were not included in the multivariable regression to avoid multicollinearity with age ($P < .001$). Neither the professional rank of physicians

Table 2. Musculoskeletal symptoms among Saudi physicians.

Body part	In the past 7 days	In the past 12 months	Preventing normal activities in the past 12 months
Any part			
No	1935 (55.41)	1159 (33.19)	2285 (65.44)
Yes	1557 (44.59)	2333 (66.81)	1207 (34.56)
Neck			
No	2909 (83.30)	2372 (67.93)	3024 (86.60)
Yes	583 (16.70)	1120 (32.07)	468 (13.40)
Shoulder			
No	2936 (84.08)	2318 (33.62)	3080 (88.20)
Yes	556 (15.92)	1174 (33.62)	412 (11.80)
Upper Back			
No	2934 (84.02)	2411 (69.04)	3073 (88.00)
Yes	558 (15.98)	1081 (30.96)	419 (12.00)
Elbows			
No	3209 (91.90)	2986 (85.51)	3226 (92.38)
Yes	283 (08.10)	506 (14.49)	266 (07.62)
Wrists/Hands			
No	3098 (88.72)	2664 (76.29)	3154 (90.32)
Yes	394 (11.28)	828 (23.71)	338 (09.68)
Lower Back			
No	2688 (76.98)	2010 (57.56)	2876 (82.36)
Yes	804 (23.02)	1482 (42.44)	616 (17.64)
Hips/Thighs/Buttocks			
No	3134 (89.75)	2756 (78.08)	3168 (90.72)
Yes	358 (10.25)	736 (21.08)	324 (09.28)
Knees			
No	3006 (86.08)	2633 (75.40)	3098 (88.72)
Yes	486 (13.92)	859 (24.60)	394 (11.28)
Ankles/Feet			
No	3007 (86.11)	2702 (77.38)	3143 (90.01)
Yes	485 (13.89)	790 (22.62)	349 (09.99)

Table 3. Bivariate analyses of factors with musculoskeletal disorders among Saudi physicians.

Characteristics	Musculoskeletal disorders preventing normal activities		
	No 2285 (65.44)	Yes 1207 (34.56)	*P*-value
Age			<.001
25 < 35	1535 (67.71)	732 (32.29)	
35 < 45	477 (65.08)	256 (34.92)	
45 < 55	211 (55.82)	167 (44.18)	
55 < 65	62 (54.39)	52 (45.61)	
Sex			.04
Males	1261 (66.90)	624 (33.10)	
Females	1024 (63.72)	583 (36.28)	
Chronic conditions			<.001
No	261 (54.95)	214 (45.05)	
Yes	2024 (67.09)	993 (32.91)	
Professional rank			.06
Service	564 (64.98)	304 (35.02)	
Resident	886 (68.05)	416 (31.95)	
Specialist	482 (62.76)	286 (37.24)	
Consultant	353 (63.72)	201 (36.28)	
Years of practice			<.001
<1	486 (65.59)	255 (34.41)	
1 < 5	884 (69.77)	383 (30.23)	
5 < 10	424 (63.47)	244 (36.53)	
10 < 15	266 (64.41)	147 (35.59)	
15 < 20	107 (54.59)	89 (45.41)	
>20	118 (57.00)	89 (43.00)	
Type of speciality			.79
Medical	1464 (65.59)	768 (34.41)	
Surgical	821 (65.16)	439 (34.84)	
Working in shifts			.08
Yes	998 (63.89)	564 (36.11)	
No	1287 (66.68)	643 (33.32)	
Have a gym a membership			.42
Yes	518 (64.27)	288 (35.73)	
No	1767 (65.79)	919 (34.21)	
Body Mass Index			.21
Underweight	110 (67.07)	54 (32.93)	
Normal weight	1051 (66.90)	520 (33.10)	
Overweight	786 (64.80)	427 (35.20)	
Obese	338 (62.13)	206 (37.87)	
Physical activity			.84
Low	1446 (65.16)	773 (34.84)	
Moderate	502 (66.31)	255 (33.69)	
High	337 (65.31)	179 (34.69)	

nor their type of speciality were significant factors at the bivariate level (*P* > .05). Interestingly, low and high levels of physical activity had similar rates of MSDs.

Factors Related to Musculoskeletal Disorders According to Multivariable Analyses

After adjustment for age, sex, presence of chronic conditions, working in shifts, and BMI, several factors were found to be predictors of MSDs (Table 4). Age was a significant predictor, and an increase in risk is found for increasing age groups (*P* for trend <.001). Significant elevated risk is seen for both the 45 < 55 years and the 55 < 65-year-olds (OR = 1.60, 95% CI = 1.27-2.01 and OR = 1.10, 95% CI = 1.10-2.41) respectively. Females were 23% more likely to have MSDs (95% CI = 1.07-1.86). Furthermore, physicians with chronic conditions (OR = 1.52, 95% CI = 1.24-1.37) and physicians who work in shifts (OR = 1.18, 95% CI = 1.03-1.37) also were more likely to have MSDs. The data also shows a non-significant increase in risk with increasing BMI (*P* for trend <.001). Moderate physical activity confers a degree of protection against MSDs, although this association was not significant in the current sample.

Table 4. Unadjusted and adjusted odds ratios for independent risk factors of musculoskeletal symptoms.

	Musculoskeletal disorders preventing normal activities					
	Unadjusted bivariate logistic regression estimates			Adjusted bivariate logistic regression estimates		
Predictors	*P*-value	OR	95% CI	*P*-value	OR	95% CI
Age						
25 < 35				Ref		
35 < 45	.18	1.12	0.94-1.34	.24	1.11	0.92-1.33
45 < 55	<.001	1.65	1.33-2.07	<.001	1.60	1.27-2.01
55 < 65	.003	1.75	1.20-2.56	.01	1.63	1.10-2.41
Sex						
Males				Ref		
Females	.04	1.15	1.01-1.32	.004	1.23	1.07-1.42
Chronic conditions						
No				Ref		
Yes	<.001	1.67	1.367-2.03	<.001	1.52	1.24-1.86
Working in shifts						
No				Ref		
Yes	.85	1.13	0.98-1.30	.01	1.18	1.03-1.37
Body Mass Index						
Underweight	.96	0.99	0.70-1.39	.88	0.97	0.69-1.37
Normal weight				Ref		
Overweight	.93	1.09	0.93-1.28	.43	1.06	0.90-1.25
Obese	.04	1.23	1.01-1.50	.27	1.12	0.91-1.38
Physical activity						
Low				Ref		
Moderate	.56	0.95	0.79-1.13	.60	0.95	0.79-1.13
High	.95	0.99	0.81-0.21	.69	1.04	0.84-1.28

Discussion

The aim of this study was to estimate the prevalence of MSDs in at least 1 body region among Saudi physicians and explore their association with their pattern of physical activity as well as other sociodemographic and work-related factors. The results have shown that the prevalence of MSDs in the 7 days preceding the study was 44.59%, 66.81% in the past 12 months, while the prevalence of MSDs preventing normal activities during the past 12 months was 34.56%. Also, among the current sample of physicians, moderate and vigorous physical activity was non-significantly associated with a lower prevalence of MSDs. Interestingly, the results also show a significant reduction in the risk of MSDs with high physical activity prior to adjustment, whilst after adjustment no association was found. The significant contributing factors to MSDs included age, sex, presence of chronic conditions, and working in shifts.

In Saudi Arabia, a limited number of research was done on MSDs among very specific health specialities, with extremely high, but slightly differing rates. For example, the prevalence of musculoskeletal symptoms in any body region has been reported to be 88.9% among radiologists and 77.9% among dentists.[4,5] Considering the nature of those occupations which include prolonged static positions and the use of hand and wrists movements, such high figures are understandable compared to the broader sample of physicians from different specialties in the current study.

The most common MSDs reported in the past 12 months was in the lower back region reaching 42.44%. The prevalence of lower back pain is even higher than the 38% reported in a systematic review of 165 populations worldwide.[12] Although the etiology of low back pain is multifactorial, the Global Burden of Disease study in 2016 has found that both obesity and occupational factors play an integral role in the development of symptoms in this site. The former identified as a significant factor in this study, while the latter was beyond the scope of the current study objectives.[2] The lower back was also the most common site reported as preventing normal activities.

Physical Activity and Musculoskeletal Symptoms

The pattern of physical activity reported in this large sample of physicians is concerning. In a previous study limited to a sample of only 360 physicians, the prevalence of moderate and high physical activity was much higher than currently

shown.[13] However, the fact that no specific validated tool was used in collecting their data on physical activity is problematic. Nevertheless, the current results are in line with rates from the general Saudi population, where a study that has used a validated tool for physical activity reported 66.6%, 16.8%, and 16.6% for low, moderate, and high physical activity levels.[14]

Interestingly, the results prior to adjustment have shown that higher physical activity levels were preventive, although this association ceased in the multivariable adjusted model. The direction of an increased risk with high physical activity, albeit non-significant, has been similarly reported amongst nurses in California.[15] The study stated that the association between musculoskeletal symptoms and physical activity is bidirectional. Furthermore, other similar results have been reported in a Dutch population-based study in which they concluded that no strong association was found between physical activity and musculoskeletal pain in general,[16] and musculoskeletal pain in specific body regions.[17]

It is worth investigating whether high physical activity performed outside the fitness center environment and under the supervision of a trainer has a role to play. Indeed, the small number of physicians with a gym membership in the current sample (23.08%), along with the COVID-19 pandemic and its implications on the fitness industry prompting the closure of gyms, suggests that the majority perform physical activity at home. Unsupervised exercise may lead to musculoskeletal injuries, triggering self-reported symptoms.

Physical activity is established as a preventive measure against a plethora of health problems, both physical and psychological. In terms of musculoskeletal symptoms, several interventional studies have concluded its positive effects in general, and on the shoulder, neck and back area specifically.[18-20] However, high levels of physical activity do not always guarantee lower levels of MSDs. Given their multifactorial nature, it has been proposed that a combination of physical exercises, educational interventions, especially in relation to work-related symptoms, as well as a healthy psychosocial environment together work well in the reduction of risk.[19,21]

Other Predictors of Musculoskeletal Symptoms

The study shows that in line with the literature, risk of MSDs increases linearly with age. Age related degenerative changes as well as a decrease in functional capacity in older physicians may have contributed to this association. Furthermore, a significant increased risk was found among females. Other studies have also found increased risk amongst females both in Saudi Arabia,[4]

and globally.[16,22] Various explanations have been given for the consistent difference in risk between sexes, which includes vulnerability of females to the risk factors of musculoskeletal symptoms. Moreover, within a social construct, roles that are assigned to males and females significantly affect time management, where women are more likely to put family and household responsibilities ahead at the expense of their own interest, while men tend to be free to exercise and alleviate stress through leisure activities. Also, physiological differences between the 2 in terms of menstruation, pregnancy, muscle tone, and bone mass as well as the likelihood of reporting somatic symptoms among females may add to this increased risk.[12]

Current results suggest that individuals reporting chronic conditions are at a significant increased risk of MSDs. Evidence has shown that certain chronic conditions such as Diabetes Mellitus is associated with an elevated risk of musculoskeletal symptoms. In a population-based retrospective cohort study, the 10-year cumulative incidence of musculoskeletal pain was higher in the diabetic compared to the non-diabetic group.[23] The study concluded that factors inherent to diabetes such as hyperglycemia, obesity, and other physical functions may be responsible. Although, non-significant after adjustment, the study has demonstrated an elevated risk of musculoskeletal symptoms with high BMI levels. Research has also found positive direct associations with obesity.[2,24,25] Obesity can cause biomechanical stress on joints and may cause changes to gait and posture.

Among this sample of physicians, working in shifts is an independent predictor for MSDs. Shift work is a work-related characteristic, that has been studied among health workers of different specialties with similar significant increased risks as shown in a systematic review of 23 studies.[26] The risk of accidents tends to be lower during day shift compared to night shifts, and early start times are associated with more fatigue and sleepiness. However, shift duration and time of shifts were not examined in the current study.

This is the first research to successfully quantify the levels of physical activity on a large sample of Saudi physicians and examine its association with musculoskeletal symptoms. However, the cross-sectional nature of the study does not assure causality. Furthermore, the use of a self-reported questionnaire may have introduced some degree of recall bias. It is also important to note that musculoskeletal symptoms are multifactorial in nature, and include both physical and psychosocial factors. Psychosocial factors were not examined in this study.

The high prevalence of musculoskeletal disorders and the low physical activity levels warrant attention. Preventive

measures both in the workplace and elsewhere, such as supervised physical activity, especially with vigorous exercise and work-related interventions are important for the wellbeing of our frontline health workers.

Conclusion

The level of moderate and low physical activity in this large sample of physicians is quite low, while the prevalence of musculoskeletal symptoms is considerably high. Moderate physical activity does confer protection, although not statistically significant in this population. Significant predictors included older age groups, females, physicians working in shifts, and the presence of chronic condition. Current results warrant the consideration of preventive measures for physicians.

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