Original Article

Musculoskeletal disorders of the upper and lower limb

Prevalence among patients in Eastern province, Saudi Arabia

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ABSTRACT

الأهداف: تحديد معدل انتشار اعتلالات الجهاز العضلي الهيكلي في الأطراف العلوية والسفلية بين المرضى البالغين المحولين إلى العلاج الطبيعي.

المنهجية: تم تحليل البيانات بأثر رجعي من السجلات الصحية الإلكترونية للمرضى المحولين إلى العلاج الطبيعي بين أبريل 2021 وأبريل 2023. تم تصنيف اعتلالات الجهاز العضلي الهيكلي بناءً على منطقة الجسم المصابة (الطرف العلوي أو السفلي).

النتائج: تم إحالة ما مجموعه 11243 مريضًا إلى العلاج الطبيعي، منهم 4156 مريضًا (37%) يعانون من اعتلالات الجهاز العضلي الهيكلي. كانت المناطق الأربع الأكثر إصابة هي الركبة (27.7%)، تليها الكتف (26.9%)، الكاحل / القدم (14.9%)، والمعصم / اليد (11.8%). داخل كل منطقة، كانت الاعتلالات الأكثر شيوعًا على النحو التالي: الركبة (التهاب المفاصل [26.5%]، الالتواء / الشد [20.1%]، الألم [10.1%]؛ الكتف (الألم [20.2%]، متلازمة العضلة الدوارة [18.5%]، التهاب الكبسولة اللاصق [8.5%]؛ الكاحل / القدم (الالتواء / الشد [23.3%]، الكسر [14.3%]، الألم [8.9%]؛ والمعصم / اليد (الكسر [24.1%]، الألم [8.9%]، الالتواء / الشد [7.6%]). كشف تحليل كرامر عن ارتباط قوي بين العمر ومنطقة اعتلالات الجهاز العضلي الهيكلي (V = 0.234، $p<0.001$) وبين جنس المريض ومنطقة اعتلالات الجهاز العضلي الهيكلي (V =0.189، $p<0.001$).

الخلاصة: تُظهر هذه الدراسة معدل انتشار اعتلالات الجهاز العضلي الهيكلي في الأطراف العلوية والسفلية بين المرضى البالغين المحولين إلى العلاج الطبيعي. هناك حاجة إلى مزيد من البحث الذي يشمل عينات أكبر وتمثل العينات بشكل أفضل لفهم انتشار وعوامل الخطر لاعتلالات الجهاز العضلي الهيكلي في المملكة العربية السعودية بشكل كامل.

Objectives: To determine the prevalence of upper and lower limb musculoskeletal (MSK) disorders among adult patients referred to physical therapy.

Methods: Data were retrospectively analyzed from electronic health records of patients referred to physical therapy between April 2021 and April 2023. MSK disorders were categorized based on the affected body region (upper or lower limb).

Results: A total of 11,243 patients were referred to physical therapy, of whom 4,156 (37%) had MSK disorders. The 4 most commonly affected regions were the knee (27.7%), followed by the shoulder (26.9%), the ankle/foot (14.9%), and the wrist/hand (11.8%). Within each region, the most prevalent disorders were as follows: knee (arthritis [26.5%], sprain/strain [20.1%], pain [10.1%]); shoulder (pain [20.2%], rotator cuff-related syndrome [18.5%], adhesive capsulitis [8.5%]); ankle/foot (sprain/strain [23.3%], fracture [14.3%], pain [8.9%]); and wrist/hand (fracture [24.1%], pain [8.9%], sprain/strain [7.6%]). Cramer's V analysis revealed a strong association between age and the region of MSK disorders (Cramer's V=0.234, $p<0.001$) and between patient sex and the region of MSK disorders (Cramer's V=0.189, $p<0.001$).

Conclusion: This study demonstrates the prevalence of upper and lower limb MSK disorders among adult patients referred to physical therapy. Further research involving larger, representative samples is warranted to fully understand the prevalence and risk factors of MSK disorders in Saudi Arabia.

Keywords: lower extremity, orthopedic, physical therapy, upper extremity

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Musculoskeletal (MSK) disorders are conditions that encounter the bones, cartilage, ligaments, tendons, muscles, and nerves. These disorders can cause joint stiffness, pain, limited mobility, and functional disability. If severe, they can result in psychological disorders such as depression. Musculoskeletal disorders have impacts on health care needs, costs, and societal implications is significant.[1] In 2017, these disorders ranked fifth overall in terms of disability-adjusted life years (DALYs). However, MSK disorders were number one in causing years lost due to disability.[2] A study by Liu et al[3] (2019) found that MSK disorders resulted in an estimated 117 thousand deaths, 322 million cases, and 150 million DALYs. Musculoskeletal disorders are common in people of all ages, but they are particularly prevalent in children, adolescents, and the older adults. Musculoskeletal disorders ranked third among causes of DALYs among younger adults over the past 30 years, with substantial increases in incidence (36.2%), prevalence (39.3%), and DALYs (21.2%).

Lower back pain (LBP) tops the list of most prevalent MSK disorders, followed by conditions like osteoarthritis, rheumatoid arthritis, neck pain, gout, and a wide range of others.[4] Moreover, over the past 3 decades, LBP and neck pain among adolescents and young adults have accounted for "47.2% and 15.4%", respectively, of the burden of MSK disorders in terms of DALYs.[1] Notably, prevalence data on other MSK disorders affecting the upper and lower limbs are scarce. Additionally, only a single study has calculated MSK disorders from 1990 to 2013 for 22 Eastern Mediterranean countries, including Saudi Arabia.[5]

Furthermore, in Saudi Arabia, the point prevalence of rheumatoid arthritis is estimated to be between 0.88 per 1000, and age-standardized DALYs for LBP are 1.15 times higher in females compared to males.[5] Although several trials have explored MSK disorders prevalence in Saudi Arabia, their focus has been on healthcare professionals and other workers.[6-9] To the best of our knowledge, only one trial has studied the occurrence of upper limb MSK disorders.[10] However, this study evaluated the prevalence of MSK disorders among a specific group of participants (university students) during COVID-19.

Data on the prevalence of lower limb MSK disorders among various populations in Saudi Arabia is scarce. Understanding the trends in the impact of MSK disorders is crucial for informing effective disease description and prevention strategies.[3] The rapidly growing burden of MSK disorders is rising as a critical public health challenge. Many questions remain about the root causes of these disorders. Further research is crucial to develop effective prevention and treatment strategies. In light of the limited research on this topic both internationally and in Saudi Arabia, the aim of this study was to explore the prevalence of upper and lower limb MSK disorders in patients referred to physical therapy.

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Methods. Data was gathered from the Physical Therapy Department at King Fahd University Hospital, Saudi Arabia. In Saudi Arabia, patients typically require a referral from a medical doctor to receive physical therapy services.[11] This retrospective study received ethical approval from the ethics review board at Imam Abdulrahman Bin Faisal University (IRB-2023-03-460, November 5, 2023).

Researcher collected patients' demographics and medical history from the electronic health record (EHR) system of the hospital "Harris Flex, version 6.4.2.20 (Harris Healthcare, New York, USA.)" The study collected data of new adult patients referred to the physical therapy department. The patients' data included nationality, gender, age, care type, and region of MSK disorder. Patients referred with MSK disorders were further analyzed. Musculoskeletal disorders were categorized based on the affected body region: upper extremity (shoulder, arm, elbow, forearm, and wrist and hand) and lower extremity (hip, thigh, knee, lower leg, and foot and ankle). Data was collected over a 2-year period, from April 2021 to April 2023.

Statistical analysis. Data analysis was executed using IBM SPSS Statistics for Windows, version 27.0 (IBM Corp., Armonk, N.Y., USA). The prevalence of MSK disorders was determined by calculating frequencies and percentages. Each unique patient referral to physical therapy, identified by a distinct diagnosis, was included in the analysis. Patients referred with the same diagnosis on multiple occasions were counted only once. Differences in prevalence between male and female patients were evaluated using an independent-sample t-test. The correlations between gender or age group and leading regions with MSK disorders were investigated using 2 statistical tests: Cramer's V and chi squared. Cramer's V values interpret association as follows: 0.05 - 0.10 (weak), 0.10 - 0.15 (moderate), 0.15 - 0.25 (strong), or above 0.25 (very strong).[12] To evaluate age differences among the leading body regions

with MSK disorders, a one-way analysis of variance (ANOVA) was used, followed by the Bonferroni post hoc testing. Significant differences were at a *p*-value of <0.05.

Results. Between April 1, 2021, and April 30, 2023, 11,243 patients were referred for physical therapy. Among them, 4,156 (37%) patients had MSK disorders. Their mean age was 48.4 ± 16.0 years (range: 18.0–106.0 years). Female (n=2,346 [56.4%]) patients outnumbered male (n=1,810 [43.6%]) patients. Females (51.7 ± 15.0 years) were also older than males (42.85 ± 16.5 years). This difference was statistically significant (mean difference: 8.9 years; 95% confidence interval [CI]: -9.843 to -7.916; t: -18.066; degree of freedom [df]: -18.066; p<0.001). The majority of patients were Saudi (n=3,502 [84.3%]) and received outpatient care (n=2,346 [56.4%]) (Table 1).

The distribution of MSK disorders in the upper and lower limbs is illustrated in Figure 1 and Table 2. Apparently, the frequency of MSK disorders exceeds the number of patients because some patients experienced multiple MSK disorders in one or more regions. Among the body regions, the knee was the most frequent, affecting 27.7% of patients. Shoulder injuries followed closely at 26.9%, with ankle/foot and wrist/hand injuries trailing behind at 14.9% and 11.8%, respectively. The characteristics of patients with MSK disorders in these 4 leading regions will be further discussed.

Table 3 presents the prevalence of MSK disorders in the 4 most commonly affected regions. The 3 most prevalent disorders in each region are as follows: knee (arthritis [26.5%], sprain/strain [20.1%], pain [10.1%]); shoulder (pain [20.2%], rotator cuff-related syndrome [18.5%], adhesive capsulitis [8.5%]); ankle/foot (sprain/strain [23.3%], fracture [14.3%], pain [8.9%]); and wrist/hand (fracture [24.1%], pain [8.9%], sprain/strain [7.6%]). A higher prevalence of MSK disorders was found in outpatients compared to inpatients, particularly for the most commonly affected body sites. This could be explained by the observed difference in referral rates between the 2 groups, as shown in Table 1, with a higher number of patients referred to outpatient care than inpatient care. Despite being low in prevalence, injury-related disorders, such as fractures (5.5%) and strains/sprains (≥0.3%), were the most common diagnoses in inpatient care.

Table 4 shows a trend towards older patients (50 years or older) having more MSK disorders in the knees

Table 1 - Demographic characteristics of patients who experienced musculoskeletal disorders in the upper and lower limb (n=4156).

Variables	n	(%)
Age (years)		
< 30	721	17.3
30-49	1376	33.1
50-69	1694	40.8
≥70	365	8.8
Gender		
Male	1810	43.6
Female	2346	56.4
Nationality		
Saudi	3502	84.3
Non-Saudi	654	15.7
Care type		
Outpatient	3631	87.4
Inpatient	525	12.6

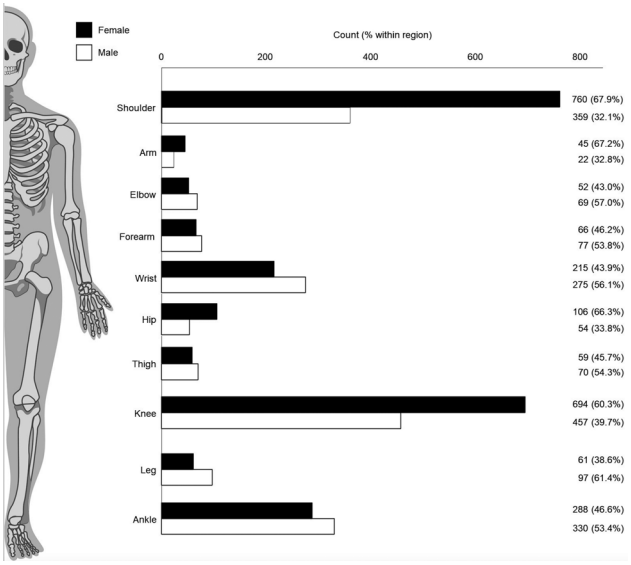

Figure 1 - Count (percentage) of patients referred with musculoskeletal disorders in different body regions categorized by gender (n=4156). (*Body chart from www.freepik.com, with permission.)*

Table 2 - Results of musculoskeletal disorders categorized by body regions (n=4156).*

Pain region	n	(%)
Shoulder	1119	26.9
Arm	67	1.6
Elbow	121	2.9
Forearm	143	3.4
Wrist/hand	490	11.8
Hip	160	3.8
Thigh	129	3.1
Knee	1151	27.7
Lower leg	158	3.8
Ankle/foot	618	14.9

*Some patients may have experienced musculoskeletal disorders in more than one region.

Table 3 - The frequency of musculoskeletal disorders that manifested the 4 most commonly affected regions.

Knee (n=1744)*		Shoulder (n=1296)*		Ankle/foot (n=853)*		Wrist/hand (n=630)*	
Disorder	n (%) OP / IP	Disorder	n (%) OP / IP	Disorder	n (%) OP / IP	Disorder	n (%) OP / IP
Arthritis	434 (24.9) / 28 (1.6)	Pain	260 (20.1) / 1 (0.1)	Sprain/strain	179 (20.9) / 20 (2.3)	Fracture	151 (24.0) / 1 (0.2)
Sprain/strain	315 (18.1) / 36 (2.1)	RCRSP	238 (18.4) / 2 (0.2)	Fracture	75 (8.8) / 47 (5.5)	Pain	56 (8.9) / -
Pain / PFPS	233 (13.4) / 9 (0.5)	Adhesive capsulitis	106 (8.2) / 4 (0.3)	Pain	72 (8.4) / 4 (0.5)	Sprain/strain	46 (7.3) / 2 (0.3)
Meniscus tear	91 (5.2) / 4 (0.2)	Sprain/strain	78 (6.0) / -	Arthritis	26 (3.0) / 7 (0.8)	Trigger finger	46 (7.3) / -
ACL tear	71 (4.1) / 7 (0.4)	Arthritis	52 (4.0) / 4 (0.3)	Achilles tendinopathy	14 (1.) / 6 (0.7)	Carpal tunnel syndrome	27 (4.3) / -
Fracture	16 (0.9) / 5 (0.3)	Dislocation	43 (3.3) / -	Plantar fasciopathy	15 (1.8) / -	De Quervain tenosynovitis	14 (2.2) / -
Other/ Unspecified injury#	411 (23.6) / 84 (4.8)	Fracture	27 (2.1) / -	Flat foot	12 (1.4) / -	Other/Unspecified injury#	253 (40.2) / 34 (5.4)
		Other/Unspecified injury#	469 (36.2) / 12 (0.9)	Other/ Unspecified injury#	262 (30.6) / 114 (13.3)		

* 'n' represents the total number of musculoskeletal disorders not the number of patients. ACL: anterior cruciate ligament, IP: inpatient, OP: outpatient, PFPS: patellofemoral pain syndrome, RCRSP: rotator cuff related shoulder pain. # This category included disorders or injuries such as abrasion, contusion, cellulitis, bursitis, myositis, and deformity. Data are shown as counts and percentages. The data shows the percentage of people experiencing musculoskeletal disorders in a particular region.

Table 4 - Characteristics of patients with musculoskeletal disorders in top 4 body regions.

Variables	Knee (n=1151)	Shoulder (n=1119)	Ankle/foot (n=618)	Wrist/hand (n=490)
Age (years)	51.4 ± 16.0	51.1 ± 14.5	42.8 ± 15.7	44.1 ± 16.7
Age groups (years)				
<30	140 (26.9)	115 (22.1)	153 (29.4)	113 (21.7)
30-49	336 (30.7)	342 (31.2)	241 (22.0)	177 (16.1)
50-69	539 (36.6)	568 (38.6)	199 (13.5)	166 (11.3)
≥70	136 (47.1)	94 (32.5)	25 (8.7)	34 (11.8)
Gender				
Male	457 (32.2)	359 (25.3)	330 (23.2)	275 (19.4)
Female	694 (35.5)	760 (38.8)	288 (14.7)	215 (11.0)
Nationality				
Saudi	961 (33.5)	984 (34.3)	521 (18.1)	405 (14.1)
Non-Saudi	190 (37.5)	135 (26.6)	97 (19.1)	85 (16.8)
Care type				
Outpatient	1038 (33.9)	1099 (35.9)	466 (15.2)	457 (14.9)
Inpatient	113 (35.5)	20 (6.3)	152 (47.8)	33 (10.4)

Data are shown as numbers and percentages (%), but age is shown as mean ± standard deviation. The data shows the percentage of people experiencing musculoskeletal disorders in a particular region.

(≥36.6%) and shoulders (≥32.5%). In contrast, younger patients (<30 years) demonstrated a higher prevalence of disorders in the ankle and foot (29.4%) and the wrist and hand (21.7%). A strong association was observed between age and the regions of MSK disorders (Cramer's V: 0.234, p<0.001). This was confirmed using ANOVA, which revealed a significant effect of age on the regions of MSK disorders (df=3, F=64.691, p<0.001). Patients with older age had a higher prevalence of MSK disorders in the shoulder compared with the wrist and hand (p<0.001; 95% confidence interval[CI]: 4.83 to 9.28) and the ankle and foot (p<0.001; 95% CI: 6.32 to 10.43). Similarly, the knee exhibited a significantly greater prevalence of MSK disorders compared with

the wrist/hand (p<0.001; 95% CI: 5.05 to 9.48) and the ankle/foot (p<0.001; 95% CI: 6.53 to 10.63). A significant association was observed between patient gender and the region of MSK disorders (Cramer's V: 0.189, p<0.001).

Discussion. The current study estimated the prevalence of MSK disorders amongst adults in Saudi Arabia who were referred to physical therapy over a 2-year timeframe. The knee, shoulder, ankle/foot, and wrist/hand were the 4 most commonly affected regions. The most prevalent disorders within each region were as follows: knee (arthritis, sprain/strain, pain), shoulder (pain, rotator cuff-related syndrome, adhesive capsulitis), ankle/foot (sprain/strain, fracture, pain), and wrist/hand (fracture, pain, sprain/strain). Age and gender were both strongly correlated with the body regions of MSK disorders.

In this study, 4,156 (37%) of the patients referred for physical therapy were diagnosed with MSK disorders affecting the upper or lower extremities. This prevalence rate is comparable to the findings of an Iranian study conducted by Davatchi et al,[13] who reported a prevalence of 44.7% of MSK complaints, including upper and lower limbs and the spine, over 7 days. A 2019 study on the Global Burden of Disease (GBD) estimates that approximately 1.7 billion individuals worldwide are living with MSK disorders, representing a significant global health concern.[14]

The 4 most commonly affected regions in our study were the knee (27.7%), followed by the shoulder (26.9%), the ankle/foot (14.9%), and the wrist/hand (11.8%). In Saudi Arabia, several studies have investigated the prevalence of MSK disorders related to work among various occupational groups. AlMubarek et al[6] discovered a high prevalence of MSK disorders among sonographers. Among the sonographers surveyed, 65.3% reported shoulder symptoms and 57.1% reported neck symptoms. Similarly, studies focused on schoolteachers reported a substantial prevalence of MSK disorders.[8,9] Althomali found that 93.63% (235 of 251 teachers) were affected by MSK disorders, whereas Alajmi et al[8] reported a prevalence of 65.6% (244 of 372 teachers).[9] Both studies identified the shoulder as the most commonly affected region, followed by the knee and other upper and lower limbs. The high prevalence observed in these studies may be attributed to the use of the Nordic Musculoskeletal Questionnaire, which is primarily designed to assess musculoskeletal symptoms rather than MSK disorders or diagnoses. In Iran, Davatchi et al[13] found that the most commonly symptomatic sites were "the knees (27%), the thoraco-lumbar spine (24%), the shoulders (16%), and the cervical spine (14%)." It is worth noting that the study by Davatchi et al[13] focused specifically on rheumatic diseases, whereas our study included a broader range of MSK disorders.

The current study demonstrated that the most prevalent disorders within each region were as follows: knee (arthritis [26.5%], sprain/strain [20.1%], pain [10.1%]); shoulder (pain [20.2%], rotator cuff-related syndrome [18.5%], adhesive capsulitis [8.5%]); ankle/foot (sprain/strain [23.3%], fracture [14.3%], pain [8.9%]); and wrist/hand (fracture [24.1%], pain [8.9%], sprain/strain [7.6%]). The GBD study revealed that LBP is the main cause to the impact of MSK disorders (568 million cases), accounting for the highest number of YLDs (64 million). Other significant contributors include neck pain (223 million cases, 22 million YLDs), fractures (436 million cases, 26 million YLDs), osteoarthritis (344 million cases, 19 million YLDs), amputations (176 million cases, 5.5 million YLDs), rheumatoid arthritis (13 million cases, 2.4 million YLDs), and other MSK conditions (305 million cases, 11 million YLDs).[14] Notably, fractures were identified as the leading health condition requiring rehabilitation in the Gulf region.[14] Another set of data from the GBD study between 1990 and 2017 revealed that MSK disorders were responsible for an estimated "1.3 billion cases, 121,300 deaths, and 138.7 million DALYs." In 2017, LBP was the leading global cause of MSK disorders, accounting for 36.8% of cases. Less common disorders included "other MSK conditions (21.5%), osteoarthritis (19.3%), neck pain (18.4%), gout (2.6%), and rheumatoid arthritis (1.3%)." In the Middle East and North Africa, MSK disorders were responsible for an estimated 102.9 million cases, 2,903 deaths, and 11.2 thousand DALYs.[15]

A strong association between age and the frequency of MSK disorders in specific body regions was observed in the present study. Older patients had more MSK disorders in the shoulder and knee compared to the wrist/hand and ankle/foot. This age-related pattern aligns with previous findings. The prevalence of MSK disorders was highest in the 50's age group. Fejer et al[15] in their systematic review found that the most commonly MSK conditions were "back pain (29%), osteoarthritis (particularly knee) and osteoporosis (17%), followed by rheumatoid arthritis (8%), and pain in ankle/foot (8%), knee (6%), hip (5%), shoulder (5%), hand/wrist (3%), and elbow (3%)."[16] In 2017, the number of cases of MSK disorders was greatest in the 50's age group. Low back pain (LBP) peaked at the age of 85-89, osteoarthritis peaked at ≥95 years of age, and rheumatoid arthritis

peaked at the age of 70–74.15 These observations underscore the significance of acknowledging age when evaluating the risk and presentation of MSK disorders.

Our results reveal a significant relationship between patient gender and the distribution of MSK disorders, aligning with findings from global[15] and domestic studies.[6,9] Although research investigating the underlying mechanisms of gender disparities in MSK disorders remains limited, extensive research has explored the underlying mechanisms of these gender differences in MSK pain. Proposed explanations include: i) women's greater propensity to report pain, ii) women's increased susceptibility to MSK pain due to biological factors (hormonal or physiological differences), heightened pain sensitivity, or psychosocial influences, and iii) women's higher exposure to risk factors for MSK pain.[17] This study suggests that age and gender are significant factors influencing the distribution of MSK disorders. Additional research is required to understand the underlying mechanisms of these associations.

Study limitations. While this study provides valuable insights, its findings may not apply to the whole of Saudi Arabia because the study was only conducted in one center and region. Moreover, the EHR system of the hospital lacked essential demographic information, such as pain chronicity, height, weight, smoking, and employment. This, along with the inconsistency in the terms used for disorders and pain, either missing for some patients or entered differently by referring physicians and physical therapists, hindered a more comprehensive analysis. To address these limitations, it is recommended to re-code these terms into standardized formats using established coding systems like the International Classification of Diseases.

In conclusion, this study examined how common MSK disorders were in adults referred to physical therapy over 2 years, and how age and gender influenced these disorders. The findings reveal that approximately 37% (n=4,156) of these patients suffered from MSK disorders affecting various body regions, with the highest prevalence observed in the knee, shoulder, ankle/foot, and wrist/hand. Strong associations were identified between age and the affected region, as well as between sex and the affected body region. MSK disorders were more common in females and older patients. Further studies are needed with a larger and more representative sample population to gain a more comprehensive understanding of MSK disorders in Saudi Arabia.

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References

1. Guan SY, Zheng JX, Sam NB, Xu S, Shuai Z, Pan F. Global burden and risk factors of musculoskeletal disorders among adolescents and young adults in 204 countries and territories, 1990-2019. *Autoimmun Rev* 2023; 22: 103361.
2. GBD 2017 DALYs, HALE Collaborators. Global, regional, and national disability-adjusted life-years (DALYs) for 359 diseases and injuries and healthy life expectancy (HALE) for 195 countries and territories, 1990-2017: a systematic analysis for the Global Burden of Disease Study 2017. *Lancet* 2018; 392: 1859-922.
3. Liu S, Wang B, Fan S, Wang Y, Zhan Y, Ye D. Global burden of musculoskeletal disorders and attributable factors in 204 countries and territories: a secondary analysis of the Global Burden of Disease 2019 study. *BMJ Open* 2022; 12: 1-10.
4. Jin Z, Feng X, Wang D, Zhu Y, Liang J, Zhang H, et al. Global, regional and national trends in sex- and age-specific disability-adjusted life years of musculoskeletal disorders, 1990-2019. *Rheumatology (Oxford)* 2022; 61: 2978-86.
5. Moradi-Lakeh M, Forouzanfar MH, Vollset SE, El Bcheraoui C, Daoud F, Afshin A, et al. Burden of musculoskeletal disorders in the Eastern Mediterranean Region, 1990-2013: findings from the Global Burden of Disease Study 2013. *Ann Rheum Dis* 2017; 76: 1365-13673.
6. AlMubarek NA, Al-Otaibi ST, Herzallah HK. Musculoskeletal disorders among sonographers in secondary care hospitals in the city of Al-Ahsa, Saudi Arabia. *Work* 2022; 71: 1105-1111.
7. Shubayr N, Alashban Y. Musculoskeletal symptoms among radiation technologists in Saudi Arabia: prevalence and causative factors. *Acta Radiol* 2022; 63: 497-503.
8. Alajmi DM, Abdulaziz MSB, Saeed NSB, Almutairi AS. Musculoskeletal disorders associated with depression and psychosocial risk factors among female teachers in Riyadh region, Saudi Arabia. *J Family Med Prim Care* 2022; 11: 3754-3760.
9. Althomali OW. Long-term prevalence and risk factors of musculoskeletal disorders among the schoolteachers in hail, Saudi Arabia: A cross-sectional study. *Biomed Res Int* 2022; 2022: 1-7.
10. Sirajudeen MS, Alzhrani M, Alanazi A, Alqahtani M, Waly M, Manzar MD, et al. Prevalence of upper limb musculoskeletal disorders and their association with smartphone addiction and smartphone usage among university students in the kingdom of saudi arabia during the covid-19 pandemic-a cross-sectional study. *Healthcare (Basel)* 2022; 10: 2373.
11. Alshami AM. Prevalence of pain and its relationship with age and sex among patients in Saudi Arabia. *J Clin Med* 2023;13: 1-9.
12. Akoglu H. User's guide to correlation coefficients. *Turk J Emerg Med* 2018; 18: 91-93.
13. Davatchi F, Sandoughi M, Moghimi N, Jamshidi AR, Tehrani Banihashemi A, Zakeri Z, et al. Epidemiology of rheumatic diseases in Iran from analysis of four COPCORD studies. *Int J Rheum Dis* 2016; 19: 1056-1062.
14. Cieza A, Causey K, Kamenov K, Hanson SW, Chatterji S, Vos T. Global estimates of the need for rehabilitation based on the Global Burden of Disease study 2019: a systematic analysis for the Global Burden of Disease Study 2019. *Lancet* 2021; 396: 2006-2017.

15. Safiri S, Kolahi AA, Cross M, Hill C, Smith E, Carson-Chahhoud K, et al. Prevalence, deaths, and disability-adjusted life years due to musculoskeletal disorders for 195 countries and territories 1990-2017. ***Arthritis Rheumatol*** 2021; 73: 702-714.
16. Fejer R, Ruhe A. What is the prevalence of musculoskeletal problems in the elderly population in developed countries? A systematic critical literature review. ***Chiropr Man Therap*** 2012; 20: 31.
17. Cavallari JM, Ahuja M, Dugan AG, Meyer JD, Simcox N, Wakai S, et al. Differences in the prevalence of musculoskeletal symptoms among female and male custodians. ***Am J Ind Med*** 2016; 59: 841-852.