

## Work-related musculoskeletal disorders among physiotherapists in Jouf region: A cross-sectional study

**To Cite:**

Allam N, Alradi R, Alruawily A, Alruwaili K, Alsaiani T, Alruwaili R. Work-related musculoskeletal disorders among physiotherapists in Jouf region: A cross-sectional study. *Medical Science* 2022; 26: ms563e2643. doi: <https://doi.org/10.54905/disssi/v26i130/ms563e2643>

**Authors' Affiliation:**

<sup>1</sup>Department of physical therapy and health rehabilitation, collage of applied medical science, Jouf University, Saudi Arabia

<sup>2</sup>Department of physical therapy for surgery, Faculty of physical therapy, Cairo University, Egypt

**Corresponding author**

Department of physical therapy for surgery, Faculty of physical therapy, Cairo University, Egypt

Email: [dr.nesma2011@yahoo.com/nmallam@ju.edu.sa](mailto:dr.nesma2011@yahoo.com/nmallam@ju.edu.sa)

ORCID: <https://orcid.org/0000-0002-2478-4474>

**Peer-Review History**

Received: 29 November 2022

Reviewed & Revised: 03/December/2022 to 20/December/2022

Accepted: 23 December 2022

Published: 26 December 2022

**Peer-review Method**

External peer-review was done through double-blind method.

URL: <https://www.discoveryjournals.org/medicalscience>



This work is licensed under a Creative Commons Attribution 4.0 International License.

Nesma Allam<sup>1,2\*</sup>, Reem Alradi<sup>1</sup>, Amjad Alruawily<sup>1</sup>, Kholoud Alruwaili<sup>1</sup>, Taif Alsaiani<sup>1</sup>, Reham Alruwaili<sup>1</sup>

**ABSTRACT**

**Background:** Musculoskeletal disorders are most common in physiotherapists due to bad posture and repetitive movement of different body parts. **Aims:** To find out how common musculoskeletal disorders and risk factors are among physiotherapists in Jouf region. **Methods:** The present study was conducted in a cross-sectional manner. It depended on both the written and the online version; the Nordic musculoskeletal questionnaire was used to evaluate the work-related musculoskeletal disorders among physiotherapists in Jouf region. The study included both female and male physiotherapists in Jouf region who obtained at least a bachelor degree in physical therapy, their ages ranged between 25 and 45 years and working in public or private hospitals. **Results:** In the last 12 months, the neck had the most pain and discomfort (74%), followed by the low back region (56%) and the lowest area was the elbow (8%). **Conclusion:** The highest areas with pain were the neck and lower back regions among physiotherapists, due to prolonged restricted posture, improper positions and repeated tasks.

**Keywords:** Jouf region, Musculoskeletal disorders, Physiotherapists, Work.

**1. INTRODUCTION**

One of the most relevant health issues that affect workers is musculoskeletal disorders (MSDs) which include neck, low back, shoulder, elbow and hand pain (Harcombe et al., 2014; Reilly, 2002). The injuries or impairments of the skeletal muscles, joints, nerves, articular cartilages, tendons and intervertebral discs are significantly influence the condition of the performance of work and its environment (Bernard, 1997), despite several researches of ergonomic intervention (Neumann and Winkel, 2004).

The major risk factors for MSDs during work are repeated tasks, direct pressure, great force, improper joints and prolonged restricted posture as it makes health care professionals particularly susceptible to bone and muscle injury (Bork et al., 1996). WRMD may give rise to limitations of work. Physiotherapists are vulnerable to these types of injuries (Atia et al., 2015). Work activities such as heavy physical work; repeated carrying heavy loads;

over-stretched and faulty postures such as bending; twisting; repetitiveness of various joint movements; using the vibration equipment with high-frequency; psychological stress and maintaining static position for long time are the risk factors for progression of WRMD in healthcare workers as dentistry, nursing and physiotherapist (Szymanska, 2002; Akesson et al., 1995; West and Gardner, 2001; Coenen et al., 2013; Mondal and Mehedi, 2019).

In the first five years of work, half of physical therapists with expertise have musculoskeletal pain due to a hesitation to ask for help from an assistant and a lack of knowledge with proper position during practices (Coenen et al., 2013; Liao et al., 2016; Alrwayeh et al., 2010; Vieira et al., 2016; Cromie et al., 2000; Nordin et al., 2011; Glover et al., 2005). The most prevalent areas that have the initial symptoms before the age of 30 are the neck, upper back, shoulder joint, lumber spine, wrist joint, hands and knee joint (Alrwayeh et al., 2010; Nordin et al., 2011; Glover et al., 2005; Girbig et al., 2013).

Previous studies have been performed to detect MSDs in the nursing (Tariah et al., 2020), dentists (Aljanakh et al., 2015; Alghadir et al., 2015) and other medical staff communities (Al-Mohrej et al., 2020; Al Shammari et al., 2019) in Saudi Arabia, but there is a shortage in the studies applied on the physiotherapy profession in Jouf region. Because MSDs have a significant effect on physiotherapists' daily lives and work, it is essential to detect these disorders in physiotherapy profession. So, determining the incidence and risk factors of MSDs among physiotherapists in Jouf region was the purpose of the present study.

## 2. MATERIALS AND METHODS

### Participants

To assess WRMD among physiotherapists in the Jouf region, the written form and the electronic version of the Nordic Musculoskeletal Questionnaire (NMQ) were used. From the total 61 questionnaire, 11 were not included in the study according to the inclusion criteria which included females and males' physiotherapists in Jouf region who had at least the bachelor degree in physical therapy, from 25 to 45 years old, working in public or private hospitals and working hours were at least 6 hours per day. Participants with a previous musculoskeletal disorder, previous surgeries, degenerative disk, joint replacement, pregnant woman, malignancy, neurologic diseases and psychiatric disease were excluded from the study. Participants were given a brief explanation about the aim of the study, an electronic and a written informed consent was taken before participation in the online or written questionnaire, it took from 2-3 minutes to complete the questionnaire.

### Procedures

The sampling method was non probability purposive sampling. The study was performed between January and June 2022 in different hospitals in Jouf Region.

### Nordic musculoskeletal questionnaire (NMQ)

The questionnaire consisted of two sections; the first one had personal details about the specialist, type of the hospital and years of experience in the job, working time per day and nature of work and health information. The second part had a standardized table for NMQ that includes body regions and information on musculoskeletal complaints affecting these regions (Arora and Khatri, 2022).

### Statistical analysis

Mean and standard deviation were used to summarize quantitative variables, while categorical variables were summarized using frequencies and percentages. All statistical calculations were carried out using the statistical package for social studies (SPSS) version 25 for Windows.

## 3. RESULTS

### Subjects' characteristics for weight, height and BMI

Fifty physiotherapists were involved in this study. The mean ± SD weight and height of the participants were 75.2± 17 Kg and 165± 8.8 cm respectively. The mean ± SD BMI was 27.1± 4.6 kg/m<sup>2</sup> (Table 1).

**Table 1** Mean and standard deviation of weight, height and BMI

	Mean ± SD	Maximum	Minimum
Weight (kg)	75.2± 17	113	48
Height (cm)	165± 8.8	185	150

BMI (kg/m <sup>2</sup> )	27.1± 4.6	37.3	18.8
--------------------------	-----------	------	------

<sup>SD</sup> standard deviation

**Other characteristics**

More participants were aged 30-34.9 years (n= 26, 52%). While the least number of participants were aged less than 25 (n=1, 2%) and from 35-39.9 (n=1, 2%). Female physiotherapists reported a higher number of participants (n=29, 58%), while male physiotherapists were (n=21, 42%). Most of participants were working for 8 hours/day (n=33, 66%). A greater number of participants with WRMD had 6-10.9 years of experience (n=26, 52%). Participants were asked about the healthcare setting they were working. Most of them were working in a governmental hospital (n=43, 86%), while the least number were working in a private clinic (n=7, 14%). Also, they mentioned that their most common injury occurred during working in adult rehabilitation (n = 39, 78%), elderly rehabilitation (n = 34, 68%) and pediatrics rehabilitation (n = 26, 52%) (Table 2).

**Table 2** Frequency and percent of subjects’ characteristics

	Frequency	Percent
Age (years)		
less than 25	1	2%
25-29.9	26	52%
30-34.9	18	36%
35-39.9	1	2%
40-45	2	4%
More than 45	2	4%
Gender (M/F)		
Female	29	58%
Male	21	42%
Working hours (H)		
8 hours	33	66%
Less than 8	6	12%
more than 8	11	22%
Years of experience (Year)		
less than 3	10	20%
From 3 to 5.9	9	18%
From 6 to 10.9	26	52%
11 to 15	1	2%
More than 15	4	8%
Type of hospital		
Governmental	43	86%
Private	7	14%
Specialty		
Pediatric	19	38%
Adult	24	48%
Elderly	7	14%

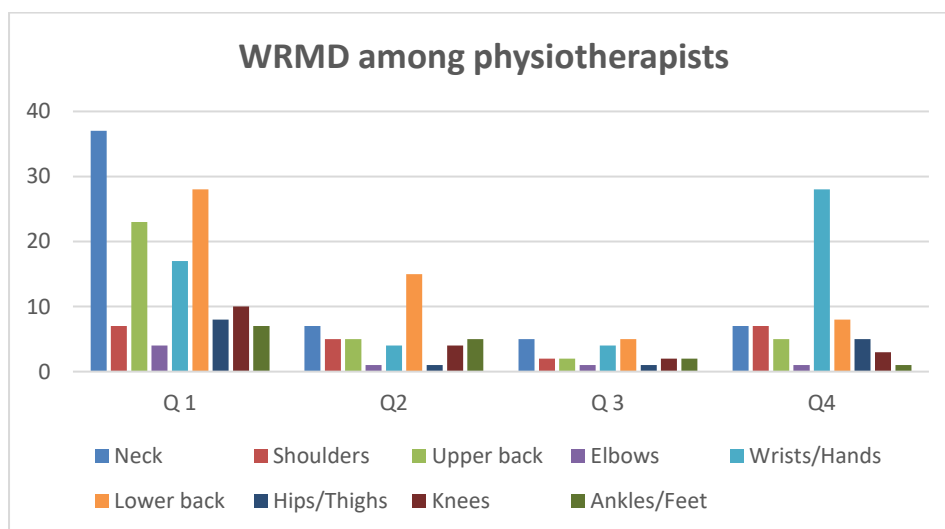
**WRMD according to NORDIC questionnaire**

Table 3 and Figure 1 illustrate the frequency and percent of MSDs among physiotherapists in Jouf region. The highest percent for pain, discomfort and numbness in the last 12 months was related to the neck (74%), lower back (56%), upper back (46%), wrists and hands (34%), knees (20%), hips and thighs (16%), shoulders (14%), ankles and feet (14%) and the lowest was the elbow (8%).

**Table 3** Frequency and percent of WRMD

	Neck	Shoulders	Upper back	Elbows	Wrists/ Hands	Lower back	Hips/ Thighs	Knees	Ankles/ Feet
	F/ P	F/ P	F/ P	F/ P	F/ P	F/ P	F/ P	F/ P	F/ P
Q1: WRMD during the last year	37/ 74%	7/ 14%	23/ 46%	4/ 8%	17/ 34%	28/ 56%	8/ 16%	10/ 20%	7/ 14%
Q2: WRMD during the last year affecting normal activities	7/ 14%	5 / 10%	5/ 10%	1/ 2%	4/ 8%	15/ 30%	1/ 2%	4/ 8%	5/ 10%
Q3: WRMD during the last year that requires to visit a doctor	5/ 10%	2/ 4%	2/ 4%	1/ 2%	4/ 8%	5/ 10%	1/ 2%	2/ 4%	2/ 4%
Q4: WRMD in the last week	7/ 14%	7/ 14%	5/ 10%	1/ 2%	28/ 56%	8/ 16%	5/ 10%	3/ 6%	1/ 2%

<sup>F</sup> Frequency      <sup>P</sup> Percent



**Figure 1** Distribution of WRMD among physiotherapists in different body parts

In addition, participants had inability to carry out normal activities during the last 12 months due to painful disorders in lower back (30%), neck (14%), shoulders (10%), ankles/feet (10%), upper back (10%), wrists/hands (8%), knees (8%), with the least per cent for elbows (2%) and hips (2%). Participants had to see a physician for these musculoskeletal conditions with the highest per cent for neck (10%), lower back (10%) and the lowest per cent for elbows (2%) and hips (2%). Participants were asked about disorders in the last 7 days, 56% of participants had a trouble in wrists/hands while 2% in elbows and ankles/feet.

**Risk factors for WRMD**

Participants were asked to detect the causes and risk factors for WRMDs among physiotherapists. Table 4 illustrates the most common risk factors for these disorders as the improper and sudden movements and manual therapy represent the highest percent (14%), followed by maintaining static position for prolonged period of time (12%).

**Table 4** Common risk factors of WRMD among physiotherapists

Risk factors	Frequency	Percent
No rest between sessions	4	8%
Carrying heavy loads	3	6%

Improper and sudden movements	7	14%
Repeated joint movements	5	10%
Using the vibration equipment with high-frequency	2	4%
Using ultrasound for long time	4	8%
Psychological stress	3	6%
Maintaining static position for prolonged period of time	6	12%
Helping patients in gait training	1	2%
Manual therapy	7	14%
Lifting patients with disability	3	6%
Continue working after injury	1	2%
Continue working after the official time	4	8%

#### 4. DISCUSSION

In the last year, the highest percent of pain discomfort and numbness was in the neck (74%) and the lowest percentage was elbow (8%). In the last 12 months, the highest percentage of participants that can't carry out the normal activities resulted in a painful disorder in the lower back (30%) and the elbows and hips (2%) were the lower percent. Participants who see the doctor for MSD with the highest percent for neck and lower back (10%) while, the lowest percent were elbows and hips (2%). In the last 7 days, participants were asked about disorders and 56% of them had trouble with wrists/hands, but 2% with elbows and ankles/feet.

The findings of the present study come in accordance with the findings of the previous studies that found low back and neck were the highest percentage of involvement among other body parts. This is because the handling and transferring patients, carrying heavy devices, applying manual therapy, standing for long time without rest, repeated twisting and leaning forward (Anyfantis and Biska, 2018).

These findings are in line with those reported by Alrowayeh et al., (2010), who revealed that the lower back symptoms are the most common musculoskeletal condition in Kuwaiti physical therapists (47.5%). The next most common problems were those involving the neck (21%), upper back (19%), shoulder (13%), hands/wrist (11%), knee (11%), ankle/foot (6%), elbow (4%) and hip/thigh (3%) areas.

Additionally, according to Atia et al., (2015) 84.9% of Egyptian physical therapists suffer from musculoskeletal disorders. Lower back pain is the most prevalent (67.9%), followed by neck (63.2%), shoulder (58.5%), hand/wrist (56.6%), knee (53.8%), upper back (17%), hip/thigh (6.6%), ankle/foot (5.7%) and elbow (3.8%).

Our findings are in line with those of Salik and Özcan, (2004), who found that (85%) of Turkish physiotherapists experienced a musculoskeletal injury at least once throughout their careers. Most injuries have affected the low back (26%) as well as the shoulders (14%) and neck (12%). Transferring the patient was the largest risk factor for harm (15%). Physiotherapists went to a doctor for their injury in (69%) of cases and (67%) of respondents mentioned that they did not limit their patient care time due to their illness.

The frequency of musculoskeletal problems among physiotherapists in Sabah, Malaysia, was investigated by Balakrishnan and Naib, (2016), the low back represents (44%) and the neck (20%), represent the majority of injuries. Maintaining the same posture for prolonged periods of time during work (82.9%) and lifting or transferring dependent patients (81.4%) represented the largest risks for injury.

According to Nordin et al., (2011), Malaysia has the highest incidence of WRMD between physiotherapists worldwide the incidence was higher in female physiotherapists. Pediatric physiotherapists had a higher prevalence of WRMD. The low back (51.7%) had the highest percentage, followed by the neck (46.5%) and the upper back (44.8%) while, the elbow (8.6%) and hand-wrist (12.0%) had the lowest percentages.

Adegoke et al., (2008) investigated the work factors of WRMDs in Nigerian physiotherapists. Female therapists had higher WRMDs and those with lower BMI. The low back (69.8%) was the most painful area, followed by the neck (34.1%). Physiotherapists younger than 30 years had the highest prevalence (61.7%).

In the United Kingdom, the percent of WRMD among physiotherapists for low back region was (22%) (Glover et al., 2005), while in Australia the percent ranged between (22%) (West and Gardner, 2001) and (62.5%) (Cromie et al., 2000). According to Bork et al., (1996) the prevalence of WRMDs for low back was (45%) in the United States.

Mondal and Mehedi, (2019) evaluated the prevalence and pattern of WRMDs among Physiotherapists in Dhaka city, Bangladesh. The most common area affected in the body was low back (45%), followed by neck (30%).

Tišlar et al., (2022) found that the incidence of WMSDs among physiotherapists in Croatia was (63.9%). The lower back, shoulders and neck were the most affected areas while the incidence was lower in physiotherapy students (46.5%). They also observed a lack of flexibility, which suggests that they need to be directed toward exercises that will make their muscles more flexible. It is important to raise people's awareness of this issue.

One study evaluated the impact of WRMDs in physiotherapists in Saudi Arabia by Muaidi and Shanb, (2016), who found that the higher area affected was the lower back which represent (46.5%) followed by neck (26.6%). WRMDs had a high relation with changing the habits during work. The prevalence of WRMDs in Physical therapists is about (47.7%). So, they are advised to avoid bad work habits, increased awareness about good body mechanics to prevent WRMDs.

The effects of discomfort, prolonged fatigue, pain and improper work habits are the main causes of the WRMD. Also, the physiotherapists work on average for 40 to 60 minutes with a patient during one session; they will be more exposed to the development of WRMD with increase in hours of work. Work-related disorder for physiotherapists can be reduced by different ways. For example, we must make appropriate plans to change the working hours, number of patients seen, remaining the workers about proper postures of different body parts during work by adjusting the height of the plinth, assistance when handling patients with heavy weight and stop the treatment for the patient if it improves their symptoms.

The limitations of the present study include: This study was carried out on the physiotherapist population of Jouf region only and small sample size. Another limitation was that this study did not assess the activity level of physiotherapists which would affect the frequency of WRMD. In addition, some of the questionnaires were filled out electronically by the participants. Therefore, some procedures should be clarified using physical examination. Moreover, the physical ability differences between males and females may affect the WRMD. Further studies are recommended to detect the correlation between WRMD and body mass index. Also, it was recommended to detect the activity level of physiotherapists and its relation with WRMD.

## 5. CONCLUSION

Finally, we found that the highest percent of pain and discomfort in the last 12 months was related to the neck (74 %), followed by low back (56%) and the lowest was the elbow (8%) as a result of manual therapy and sudden movements. We recommend, making adequate plans to change the nature of work, remaining the workers about proper postures of different parts of body.

### Ethical Approval

The ethics committee for research Qurayyat Health Affairs, Jouf accepted this study (No: H-13-S-072), which complied with the declaration of Helsinki criteria.

### Acknowledgments

The authors appreciate the cooperation of all study participants.

### Author contribution

NA designed the study and provides support. RA and AA carried out the study and collected the data. KA organized and analyzed the data. The first draft was written by TA and RA. All authors reviewed the final draft and approved it.

### Funding

This study has not received any external funding.

### Conflict of interest

The authors declare that there is no conflict of interests.

### Data and materials availability

All data sets collected during this study are available upon reasonable request from the corresponding author.

## REFERENCES AND NOTES

1. Adegoke BO, Akodu AK, Oyeyemi AL. Work-related musculoskeletal disorders among Nigerian physiotherapists. *BMC Musculoskelet Disord* 2008; 9(1):1-9. doi: 10.1186/1471-2474-9-112



2. Akesson I, Lundborg G, Horstmann V, Skerfving S. Neuropathy in female dental personnel exposed to high frequency vibrations. *J Occup Environ Med* 1995; 52(2):116–23. doi: 10.1136/oem.52.2.116
3. Al Shammari M, Hassan A, Al Dandan O, Al Gadeeb M, Bubshait D. Musculoskeletal symptoms among radiologists in Saudi Arabia: A multi-center cross-sectional study. *BMC Musculoskelet Disord* 2019; 20(1):1-0. doi: 10.1186/s12891-019-2933-1
4. Alghadir A, Zafar H, Iqbal ZA. Work-related musculoskeletal disorders among dental professionals in Saudi Arabia. *J Physiother Sci* 2015; 27(4):1107-12. doi: 10.1589/jpts.27.1107
5. Aljanakh M, Shaikh S, Siddiqui AA, Al-Mansour M, Hassan SS. Prevalence of musculoskeletal disorders among dentists in the Hail region of Saudi Arabia. *Ann Saudi Med* 2015; 35(6):456-61. doi: 10.5144/0256-4947.2015.456
6. Al-Mohrej OA, Elshaer AK, Al-Dakhil SS, Sayed AI, Aljohar S, Alfattani AA, Alhussainan TS. Work-related musculoskeletal disorders among Saudi orthopedic surgeons: A cross-sectional study. *Bone Jt Open* 2020; 1(4):47-54. doi: 10.1302/2633-1462.14.BJO-2020-0005
7. Alrowayeh HN, Alshatti TA, Aljadi SH, Fares M, Alshamir MM, Alwazan SS. Prevalence, characteristics and impacts of work-related musculoskeletal disorders: A survey among physical therapists in the state of Kuwait. *BMC Musculoskelet Disord* 2010; 11(1):1-11. doi: 10.1186/1471-2474-11-116
8. Anyfantis ID, Biska A. Musculoskeletal disorders among Greek physiotherapists: Traditional and emerging risk factors. *Saf Health Work* 2018; 9(3):314–8. doi: 10.1016/j.shaw.2017.09.003
9. Arora SN, Khatri S. Prevalence of work-related musculoskeletal disorder in sitting professionals. *Int J Community Med Public Health* 2022; 9(2):892-5. doi: 10.18203/2394-6040.ijcmph20220259
10. Atia DT, Abdelazeim FH, Radwan H. Impact of work-related musculoskeletal disorders on Egyptian pediatric physical therapists: One year follow-up study. *Trends Appl Sci Res* 2015; 10(3):175-82. doi: 10.3923/tasr.2015.175.182
11. Balakrishnan R, Naib N. Prevalence of work related musculoskeletal disorders among physiotherapists Sabah. *Int J Phys educ Sports health* 2016; 3(1):336-43.
12. Bernard BP. US Department of Health and Human Services centers for disease control and prevention, National institute of occupational safety and health. Musculoskeletal disorders and workplace factors: A critical review of epidemiologic evidence for work-related musculoskeletal disorders of the neck, upper extremity and lower back. DHHS (NIOSH) Publication 1997; 97-141.
13. Bork BE, Cook TM, Rosecrance JC, Engelhardt KA, Thomason MEJ, Wauford IJ, Worley RK. Work-related musculoskeletal disorders among physical therapists. *Phys Ther* 1996; 76(8): 827–35. doi: 10.1093/ptj/76.8.827
14. Coenen P, Kingma I, Boot CR, Twisk JW, Bongers PM, Dieen JHV. Cumulative low back load at work as a risk factor of low back pain: A prospective cohort study. *J Occup Rehabil* 2013; 23(1):11–8. doi: 10.1007/s10926-012-9375-z
15. Cromie JE, Robertson VJ, Best MO. Work-related musculoskeletal disorders in physical therapists: Prevalence, severity, risks and responses. *Phys Ther* 2000; 80(4):336-51. doi: 10.1093/ptj/80.4.336
16. Girbig M, Deckert S, Kopkow C, Latza U, Dulon M, Nienhaus A, Groneberg D, Seidler A. Work-related complaints and diseases of physical therapists protocol for the establishment of a “physical therapist cohort”(PTC) in Germany. *J Occup Med Toxicol* 2013; 8(1):1-8. doi: 10.1186/1745-6673-8-34
17. Glover W, Mcgregor A, Sullivan C, Hague J. Work-related musculoskeletal disorders affecting members of the chartered society of physiotherapy. *Phys Ther* 2005; 91(3):138-47. doi: 10.1016/j.physio.2005.06.001
18. Harcombe H, Herbison GP, McBride D, Derrett S. Musculoskeletal disorders among nurses compared with two other occupational groups. *Occup Med* 2014; 64(8): 601–7. doi: 10.1093/occmed/kqu117
19. Liao JC, Ho CH, Chiu HY, Wang YL, Kuo LC, Liu C, Wang JJ, Lim SW, Kou JR. Physiotherapists working in clinics have increased risk for new onset spine disorders: A 12 year population-based study. *Med* 2016; 95(32):e4405. doi: 10.1097/MD.0000000000004405
20. Mondal A, Mehedi MMH. Work related musculoskeletal disorders among physiotherapists in Dhaka city. *Bone Muscle* 2019; 2(1):001-4.
21. Muaidi QI, Shanb AA. Prevalence causes and Impact of work related musculoskeletal disorders among physical therapists. *J Back Musculoskelet Rehabil* 2016; 29(4):763–9. doi: 10.3233/BMR-160687
22. Neumann WP, Winkel J. Workshop introduction: Making ergonomic intervention research effective. In: Proceedings of PREMUS 2004. The fifth international scientific conference on prevention of work-related musculoskeletal disorders (Abstract Book, Vol. II). 2004
23. Nordin NA, Leonard JH, Thye NC. Work-related injuries among physiotherapists in public hospitals: A Southeast Asian picture. *Clinics (Sao Paulo)* 2011; 66(3):373-8. doi: 10.1590/S1807-59322011000300002
24. Reilly T. Musculoskeletal disorders in health-related occupations. Amsterdam: IOS Press. 2002
25. Salik Y, Özcan A. Work-related musculoskeletal disorders: A survey of physical therapists in Izmir-Turkey. *BMC*

- Musculoskelet Disord 2004; 5(1):1-7. doi: 10.1186/1471-2474-5-27
26. Szymanska J. Disorders of the musculoskeletal system among dentists from the aspect of ergonomics and prophylaxis. *Ann Agric Environ Med* 2002; 9(2):169–73. PMID: 12498585.
  27. Tariah HA, Nafai S, Alajmi M, Almutairi F, Alanazi B. Work-related musculoskeletal disorders in nurses working in the Kingdom of Saudi Arabia. *Work* 2020; 65(2):421-8. doi: 10.3233/WOR-203094
  28. Tišlar MH, Starc G, Kukec A. Work-related musculoskeletal disorders among physiotherapists and physiotherapy students in Croatia and their association with physical fitness. *Slov J Public Health* 2022; 61(3):171-80. doi: 10.2478/sjph-2022-0023
  29. Vieira ER, Svoboda S, Belniak A, Brunt D, Rose-Strprij C, Roberts L, Coata BRD. Work-related musculoskeletal disorders among physical therapists: An online survey. *Disabil Rehabil* 2016; 38(6):552-7. doi: 10.3109/09638288.2015.1049375
  30. West DJ, Gardner D. Occupational injuries of physiotherapists in North and Central Queensland. *Aust J Physiother* 2001; 47(3):179–86. doi: 10.1016/S0004-9514(14)60265-8