

Work Related Musculoskeletal Disorders Among the Physiotherapists: Sample of a Region in Turkey

Fizyoterapistlerin Meslekle İlgili Kas İskelet Sistemi Yaralanmaları: Türkiye’de Bir Bölge Örneği

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This study was presented orally on the Work-Related Musculoskeletal Problems of Physiotherapists Working in the Western Black Sea Region at the 3rd International Health Sciences Congress (29 November-1 December 2018, Ankara, TURKEY).

ABSTRACT Objective: The aim of this study was to evaluate the work related musculoskeletal disorders (WRMD) of physiotherapists; to determine the prevalence, characteristics and causes. **Material and Methods:** The research was conducted as a descriptive study. The study was conducted among 100 physiotherapists via online survey with 17 questions that includes personal and occupational history. **Results:** 84% of the physiotherapists have had musculoskeletal injury at least once in their lives. 61.9% of the subjects with musculoskeletal problems were female and 38.1% were male. Occupational injuries have been mostly low back 46.4%, cervical 42.9% and wrist-hand 35.7%. These injuries occurred mostly during bending or twisting, lifting and working in the same position for a long time. 33.3% of the physiotherapists with occupational injury visited a physician; they mostly preferred the techniques applied by their professional knowledge and skills as the treatment options. 73.8% of the physiotherapists who experienced occupational injuries changed their work habits and 46.4% of them limited contact time with patients. **Conclusion:** Physiotherapists tend to occupational injuries as one of the health-related occupational groups. According to the study, the lifelong prevalence of occupational injuries has been found to be high among physiotherapists. Many risk factors that cause WRMDs should be considered to prevent injuries.

ÖZET Amaç: Bu çalışmanın amacı çalışan fizyoterapistlerin mesleğe bağlı kas iskelet problemlerini değerlendirerek; prevalans, özellik ve nedenlerini ortaya koymaktır. **Gereç ve Yöntemler:** Tanımlayıcı türde bir çalışmadır. Çalışma 100 fizyoterapistin katılımıyla, kişisel ve meslek ile ilgili 17 soru içeren anket yoluyla yapılmıştır. **Bulgular:** Fizyoterapistlerin %84’ü hayatlarında en az bir kez kas-iskelet sistemi hasarı geçirmiştir. Mesleki kas iskelet sistemi yaralanmaları olan fizyoterapistlerin %61,9’u kadın, %38,1’i erkekti. Mesleki yaralanmalar çoğunlukla %46,4 oranında bel, %42,9 boyun ve %35,7 el-el bileğinde görüldü. Yaralanmalar daha çok eğilme aktivitesi, hasta transfer ve kaldırma hareketleri sırasında meydana gelmiştir. Meslek yaralanması olan fizyoterapistlerin %33,3’ü doktora gitmeyi tercih etmiştir. Tedavi seçeneği olarak ise fizyoterapistler en sık kendi mesleki bilgi ve becerilerini kullanmıştır. İş kazası geçiren fizyoterapistlerin %73,8’i çalışma alışkanlıklarını değiştirmiş ve %46,4’ü hastalarla sınırlı temas süresine sahip olduğu bulunmuştur. **Sonuç:** Fizyoterapistler sağlıkla ilgili meslek gruplarından biri olarak mesleki yaralanmalara eğilimlidir. Bu çalışmanın sonuçlarına göre fizyoterapistlerde mesleğe bağlı kas iskelet sistemi problemlerinin yaşam boyu prevalansı yüksek bulunmuştur. İşle ilgili kas iskelet sistemi problemlerine neden olan birçok risk faktörü yaralanmaları önlemek için göz önünde bulundurulmalıdır.

Keywords: Musculoskeletal disease; occupational injuries; physical therapists

Anahtar Kelimeler: Kas-iskelet hastalıkları; mesleki yaralanmalar; fizyoterapistler

Musculoskeletal disorders have been described as ‘the most known and common causes of physical disability and severe long-term pain affecting millions of people around the world.’¹ Work-related musculoskeletal disorders (WRMDs) are described as the

musculoskeletal injury caused by professional event. Occupational injuries can lead to shorten working time, to restrict workplace or to change the workplace.^{2,3} The etiology of musculoskeletal problems related to occupation is complex and controversial.

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Occupational injuries are affected by the physical environment and individual factors. Chronic exposure can lead to cumulative trauma and muscle injury and can cause occupational musculoskeletal problems if there is not enough time to recover the tissues.⁴ Musculoskeletal injuries are the most common occupational health problem in the manufacturing industry and heavy-duty industries. Studies have reported that occupational musculoskeletal injuries are a risk factor among healthcare professionals, physicians, physiotherapists, nurses, surgeons, and many other health professionals.^{5,6}

The literature shows that the physiotherapists have a high incidence of occupational musculoskeletal problems because they involve intensive work and direct contact with patients.^{7,8} Heavy physical workload, repetitive lifting and bearing, inappropriate postures, repetitive different joint movements, psychological stress and long-term static body position cause occupational musculoskeletal problems.^{9,10} That the physiotherapists sustain to work in the same posture at long periods and that they continue to work as injured, repetitive work, transferring patients, manual therapy techniques and workload are major risk factors. Physiotherapists have the highest frequency of occupational injury. The above mentioned situations put physiotherapists at risk for work related musculoskeletal disorders.^{11,12}

Understanding physiotherapists' problems with musculoskeletal disorders requires that there is some awareness about the working environment of these professionals.^{7,13} Studies in Western and European countries have shown that most of the available information is on physiotherapist's occupational injuries.^{9,14-17} In Turkey, little information exists regarding WRMDs among physiotherapists.¹⁰ The purpose of the study was to evaluate and to get information on WRMDs among physiotherapists in Turkey and to determine the prevalence, characteristics and causes.

MATERIAL AND METHODS

STUDY SAMPLE AND DESIGN

The study was performed in compliance with the Declaration of Helsinki. It was approved by the non-invasive health research ethics committee of

Düzce University (Decision No: 2017/113, Date: 11.09.2017).

Physiotherapists working in provinces of West Black Sea region in Turkey were included in this descriptive study. Physiotherapists who had musculoskeletal problems before starting work and those who worked for less than 1 year were excluded. Physiotherapists who wanted to participate voluntarily were included in the study. Informed consent form was obtained from all participants. We included only those aged 22-65 years among physiotherapists. All data were collected via an online questionnaire. Licensed PTs practicing were invited to participate in the survey and physiotherapists who approved the informed consent form participated in the study. The questionnaire which was simply transcribed and translated for Turkish context by Salik and Özcan was based on another publishing.^{10,18} The questionnaire consists of 17 close-ended questions that includes two part, demographic and occupational. The demographic characteristics contain gender, age, weight and height. The occupational section comprise work setting characteristics, years of experience, hours of contact with patients per week and WRMDs before and after joining the profession. In occupational section, it was questioned whether the physiotherapists had experienced any WRMDs. The physiotherapists were asked the type of the injury, the part of the body affected due to injury, specific occupational practices. Also this part contained whether the problems were reported or a physician was referred and the type of treatment applied. In addition, the participants answered the questions about which activities increased symptoms, loss of working time, changes in contact time with patients, or whether they changed the clinical study area, and whether the injuries changed the habits of physiotherapists.

The questionnaire was applied to all physiotherapist (total 270 physiotherapists, West Black Sea provinces) who were registered members of the Turkey Physiotherapy Association (member of World Confederation for Physical Therapy) between February 2018 and January 2019. One hundred twenty one physiotherapists responded. Twenty one physiotherapist were excluded from the study (total response rate 37%).

STATISTICAL ANALYSIS

Data were collected between February 2018 and January 2019 and analyzed using the IBM SPSS Statistics 24 software (SPSS 24.0). Descriptive statistics for continuous variables were calculated and expressed as mean $\pm$ standard deviation, and categorical variables were given as numbers and percent n (%). Demographic characteristics were compared between the WRMD and non WRMD groups by Pearson chi-square test. Compared variables are sex, age, body mass index (BMI), number of years in profession, hours per week in direct patient care, work experience, clinic areas. The alpha level was set at $p < 0.05$.

RESULTS

The descriptive characteristics of the participants were shown in Table 1. According to the results of this study, the power was found to be 0,80. A questionnaire was sent to all 270 physiotherapists but only 100 (37%) responded. The 100 respondents comprising 56% females and 44% males had a mean age of 29.64 ± 6.1 years and body mass index (BMI) of 23.8 ± 3.5 kg/m².

The occurrence of WRMDs and the relationship between gender, body mass index, work experience, hours during the week in patient care and clinical area were shown in Table 2. The prevalence of WRMDs reported among the physiotherapists during their occupational lives was 84% (n=84). Of all participants, 70% stated that they had experienced more than one WRMD. The prevalence of WRMDs was 61.9% among female physiotherapists (n=52) and 38.1% (n=32) among male physiotherapists. According to the chi-square analysis, there was significance for women in the rates of WRMDs when the gender compared ($\chi^2 27.42$, $p = 0.006$). When the groups were compared with or without WRMD, there was no significant difference between physiotherapists' age, BMI, work experience and patient-care time characteristics. The musculoskeletal injury prevalence of physiotherapists was similar in the clinic areas (Table 2).

The body areas affected by WRMDs were shown in Table 3. The lower back had the highest incidence of occupational musculoskeletal injury

TABLE 1: Descriptive characteristics of participants

Characteristics	All Respondents (n = 100)	
	$\bar{x} \pm SD$	n (%)
Gender		
Female		56 (56 %)
Male		44 (44 %)
Age (years) (n=100)		
Mean (SD)	29.64 ± 6.1	
Range	22-52	
BMI(kg/m²) (n=100)		
Mean (SD)	23.8 ± 3.5	
Range	16.8-33.1	
Years of PT experience (n=100)		
Mean (SD)	7.3 ± 6.1	
Range	1-33	
Hours per week in direct patient care		
Mean (SD)	38.9 ± 7.5	
Range	8-50	

n: Number, $\bar{x} \pm SD$ = Mean $\pm$ Standard Deviation.

(46.4%). Neck (42.9%), wrist-hand (35.7%), shoulder (34.5%) and thoracic (32.1%) were the other commonly affected body areas (Table 3). The major types of occupational injury were specified as muscle strain (39.3%), tendinitis (36.9%), degeneration (26.2%), vertebral disc disorders (23.8%), ligament sprain and other (21.4%). The factors that cause the most WRMDs were bending or twisting (50%), lifting (48.8%) and continuing to work in the same posture for a long time (46.4%), treatment of too many patients within 1 day (44%) and performing the same task over and over (41.7 %) (Table 4).

The most of physiotherapists (67.9%) who had occupational injuries signified that the symptoms increased after their injuries in clinic. Performing repetitive tasks (21.4%), sustaining a position for a long while (19%) and lifting (16.7%) were the most common activities that increased symptoms among the physiotherapists who had experienced a WRMDs during clinical practices. Physiotherapists who had experienced occupational injuries were asked whether there were strategies to prevent re-injury. 73.8% of all physiotherapists who suffered from WRMDs were improved preventive strategies to decrease symptoms.

TABLE 2: prevalence of WRMD's according to demographic characteristics and clinic areas.

	WRMD n (%)	No WRMD n (%)	χ^2 , p
Gender			
Female	52 (61.9)	4 (25)	7.429
Male	32 (38.1)	12 (75)	0.006*
Age			
<29	42 (50)	10 (62.5)	0.841
≥29	42 (50)	6 (37.5)	0.359
BMI			
<18	2 (2.4)	0	0.591
18-25	51 (60.7)	9 (56.3)	0.744
>25	31 (36.9)	7 (43.7)	
Work experience(years)			
<7	48 (57.1)	11 (68.8)	0.749
>7	36 (42.9)	5 (31.3)	0.387
Hours per week in direct patient care (hour)			
≤38	15 (17.9)	2 (17.9)	0.273
>38	69 (82.1)	14 (87.5)	0.601
Clinic areas			
Neurology Rehab	14 (16.7)	2 (12.5)	2.676
Orthopaedic Rehab	5 (6)	0 (0)	0.444
paediatric Rehab	43 (51.2)	7 (43.8)	
General Rehab	22 (26.2)	7 (43.8)	

*p<0.05: Statistically significant, χ^2 : pearson Chi-square test.**TABLE 3:** prevalence of body parts associated with WRMDs from different clinic areas.

	Neurology rehab n (%)	Orthopaedic rehab n (%)	Paediatric rehab n (%)	General rehab n (%)
Neck				
n=36 (%42.9)	6 (16.7)	2 (5.6)	19 (52.8)	9 (25)
Shoulder				
n= 29 (34.5 %)	4 (13.8)	3 (10.3)	18 (62.1)	4 (13.8)
Thoracic				
n= 27 (32.1 %)	5 (18.5)	4 (14.8)	13 (48.1)	5 (18.5)
Elbow / Forearm				
n= 6 (7.1 %)	2 (33.3)	0	1 (16.7)	3 (50)
Wrists Hands				
n= 30 (35.7 %)	6 (20)	1 (3.3)	14 (46.7)	9 (30)
Low back				
n= 37 (46.4 %)	7 (17.9)	2 (5.1)	18 (46.2)	12 (30.8)
Hips /Thighs				
n=8 (9.5 %)	1(12.5)	0 (0)	4 (50)	3 (37.5)
Knees				
n=13 (15.5 %)	1 (7.7)	0 (0)	4 (30.8)	8 (61.5)
Ankles/ Feet				
n=2 (2.4 %)	1 (50)	1 (50)	0	0

n: Number.

TABLE 4: Work risk factors contributing to WRMDs.

Work risk factor	n (%)
Bending or twisting forward	42 (50)
Lifting or transferring dependent patients	41 (48.8)
Working in a same position for a long time	39 (46.4)
Treating a large number of patients in a 1 day	37 (44)
performing the same task over and over	35 (41.7)
Reaching or working away from your body	20 (23.8)
performing manuel therapy techniques	19 (22.6)
unanticipated sudden movement or fall by patient	17 (20.2)
Carrying or moving heavy metarials/equipment	7 (8.3)
Slipping, tripping, falling	6 (7.1)
Other	5 (6)

n: Number.

The most commonly applied preventive strategies were the use of improved body mechanics (23.8%), increasing the patient responsibility for treatment (16.7%), avoiding lifting (15.5%) and changing working position frequently (13.1%) (Table 5).

33.3% of physiotherapists who had occupational injury visited a doctor and 23.8% of them were asked for permission from the work. 75% of physiotherapists who suffered from WRMDs stated that they preferred to use their own professional knowledge and skills techniques as the treatment option after the injuries (Table 6). In addition, these injuries caused the decreased contact duration with patients in 46.4% of the physiotherapists. According to their answers remarked that wanted to change of workplace to avoid re-injury in 42.9% of the physiotherapists. 32% of the respondents who had suffered from WRMDs wanted to change their clinical area after the occupational injury.

DISCUSSION

According to researches, musculoskeletal problems of the health professionals within contact with the patient are seen common.^{2,6,8} In the studies on the occupational injuries, it was stated that the injuries among the physiotherapists were seen in high prevalence.^{5,10,12} According to this study, 84% of the participants had experienced WRMDs and we can state that physiotherapists were occupations with moderate to high risk

for WRMDs. In another study carried out in Turkey, Salik and Özcan¹⁰ stated that 85% of physiotherapists had WRMDs.¹⁰ Considering the physiotherapy profession in the other countries, the prevalence and characteristics of WRMDs among physiotherapists were generally similar. However, some results of studies had differed.^{17,19,20} In the study, it was shown that physiotherapists tended to occupational injuries and WRMD rates were high.¹¹ In the similar studies of the other countries, lifelong prevalence of WRMDs was reported to be 68% in UK, 91% in Australia, 73.7% in Slovenia, 79.9% and 81.4% in South Korea.^{1,8,14,21,22} We stated that physiotherapist was a profession that the incidence of injuries was high in other countries as well as in our country.

The incidence of WRMDs was found to be significantly higher among female physiotherapists than men (61.9%, $p = 0.006$). Our finding was consistent

TABLE 5: Work risk factors contributing to WRMDs.

Altered Work Habits	n (%)
use improved body mechanics	20 (23.8)
Encourage patients responsibility	14 (16.7)
Avoid lifting	13 (15.5)
Change working position frequently	11 (13.1)
Decrease manuel therapy techniques	4 (4.8)
Increase use of other personnel	3 (3.6)
Stop working when symptoms occur	2 (2.4)
Change work schedule	2 (2.4)
Take more rest breaks	2 (2.4)
Increase use of mechanical aids	1 (1.2)

n: Number.

TABLO 6: percentage of treatments and response to WRMDs of participants.

	n (%)
Treatment	use of occupational knowledge 63 (75)
	Rest 9 (10.7)
	Medication 9 (10.7)
	Exercise 2 (2.4)
	Surgery 1 (1.2)
Response to WRMDs	Visiting a physician 28 (33.3)
	Be laiked due to injury 20 (23.8)

n: Number.

with other studies.^{9,22,23} Female physiotherapists are mostly physically weaker than males when we consider them physically and this acts as a disadvantage especially during patient care tasks (lifting, transferring, applying body force during treatment). Female's pregnancy may also be another factor that affects the process.¹¹ These all reasons may clarify the higher incidence of the WRMD among female physiotherapists.

When the studies about occupational injuries were investigated, spine and upper extremity problems were the most common among health professionals.²⁴⁻²⁷ When the literature was investigated, the body parts as low back, neck region and wrist-hand that the highest rate of WRMDs among physiotherapists were found.^{2,8,10,17,22} Our study results support the literature as the most injured body parts were low back, neck and hand-wrist. The most of the physiotherapists participating in this study worked in the clinical area of pediatric rehabilitation. Physiotherapists working in pediatric area stated that they suffer from the shoulder, neck and low back injuries respectively. Since physiotherapists have an intensive workload, we can say that spinal and hand-wrist injuries are common. In addition, physiotherapists have an active role in providing mobilization of patients during the rehabilitation process, which may have caused more injury to their low back and neck region.

In the literature, health care professionals experience more injuries in the lifting and transfer process of the patient while they continue to work in the same position for a while.^{10,27} According to our study, physiotherapists reported that WRMDs were caused by certain conditions during patient care. The conditions were mostly during bending and twisting, lifting and transferring, doing practice in the same position for a long time and treating too many patients in a 1 day. All this behaviours could thought to be a factor in the higher rate of low back injury. Salik and Özcan identified that the main causes of WRMDs among physiotherapists were lifting or transferring and repeated movements; Bork et al. emphasized that the main reasons of WRMDs were to work in the same posture for a long time and continue to practices although tired; Adegoke et al. reported that lifting or transfer of patients and using manual therapy tech-

niques; Nordin et al. stated that manual therapy techniques and lifting or transferring activities as a reason of WRMDs; Iqbal and Alghadir reported that high job demand, repetitive movements and other causes like lifting patients, increased effort, job control, etc. Considering the working conditions, we can state that physiotherapists were exposed to injury because they used body mechanics frequently.^{7,9-11,22}

In this study, physiotherapists who experienced WRMDs reported that they used their professional knowledge (biomechanical and ergonomic regulations and professional skills) as the treatment option (75%). In another study, the most preferred treatment option for the treatment of injuries was similar to the result of this study.²⁰ In 4 years undergraduate education in Turkey, physiotherapist candidates are taught the principles of ergonomic work. However, ergonomic conditions in the workplace should be investigated.

Previous studies have shown that physiotherapists who have experienced occupational injuries change their behavior.^{9,10} Passier and McPhail reported that responses of physiotherapists as a preventive strategies for musculoskeletal injury made more emphasis on the use of assistants, using of manual therapy and ergonomic principles, replacement of therapy techniques and avoidance of compelling activities.²⁸ Another study indicated that the bed height was adjusted by 86% of physiotherapists to prevent injury.¹ Many of the physiotherapists who had occupational injuries stated that they changed their work habits due to injury in this study. The use of improved body mechanics and posture correction are more preferred by physiotherapists of WRMDs. According to the results of this study, 46.4% of physiotherapists reported that there was a restriction on contact time with the patients, and 41.7% reported that they limited the working area to avoid injury. Limitations in the working area of physiotherapists and decreased contact time with patients may adversely affect the patient's rehabilitation process. 32% of physiotherapists with WRMDs reported that they were considering a change workplace or clinical area. Cromie et al. stated that specialty areas (neurology, orthopedic and private practice) changed because of WRMDs.⁸ According to another study, 33% of physi-

otherapists who suffered from WRMDs changed their clinical areas after the injury.¹⁰ Many factors can affect the injuries of physiotherapists. Considering this situations, physiotherapists can change the clinical area, but some factors such as workplace conditions and employer's approach should be investigated to effects on injuries.

STRENGTHS AND LIMITATION

This study was conducted only in the Western Black Sea Region. The daily activity levels of the attending physiotherapists were not questioned. In addition, the fact that differences in the daily number of patients and the ergonomic status of the working environment is the limitations of this study.

CONCLUSION

This study revealed that the prevalence of WRMDs among physiotherapists in Turkey was at a similar rate as in other countries. WRMDs are seen in other health-related professional groups (dentistry, nursing, ...) in the world; Physiotherapists are another occupational group that suffers from injuries. The causes and risk factors of more frequent injuries among female physiotherapist should be investigated in future studies. Although there are differences between work places and conditions among physiotherapists in Turkey, occupational injuries appear to be similar. Physiotherapists who have experienced occupational

injuries have used their professional knowledge and experience as a treatment option and have changed their work habits due to injury. The investigation of differences in working and ergonomic conditions may be useful for further studies.

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Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: Esra Kınacı, Safinaz Ataoğlu; **Design:** Esra Kınacı, Safinaz Ataoğlu; **Control/Supervision:** Esra Kınacı, Safinaz Ataoğlu; **Data Collection and/or Processing:** Esra Kınacı; **Analysis and/or Interpretation:** Esra Kınacı; **Literature Review:** Esra Kınacı; **Writing the Article:** Safinaz Ataoğlu, Esra Kınacı; **Critical Review:** Safinaz Ataoğlu; **References and Fundings:** Safinaz Ataoğlu, Esra Kınacı.

REFERENCES

- Glover W, McGregor A, Sullivan C, Hague J. Work-related musculoskeletal disorders affecting members of the Chartered Society of physiotherapy. *physiotherapy*. 2005;91(3): 138-47. [Crossref]
- Holder NL, Clark HA, DiBlasio JM, Hughes CL, Scherpf JW, Harding L, et al. Cause, prevalence, and response to occupational musculoskeletal injuries reported by physical therapists and physical therapist assistants. *phys Ther*. 1999;79(7):642-52. [Crossref] [PubMed]
- Luttmann A, Jäger M, Griefahn B, Caffier G, Liebers F, Organization WH. preventing musculoskeletal disorders in the workplace. 2003, 24.05.2019. [Link]
- Council NR. Musculoskeletal Disorders and the Workplace: Low Back and upper Extremities. National Academies press; 2001. p.510.
- Agrawal pR, Maiya AG, Kamath V, Kamath A. Work related musculoskeletal disorders among medical laboratory professionals: a narrative review. *Int J Res Med Sci*. 2014;2(4):1262-6. [Crossref]
- Carneiro p, Braga AC, Barroso M. Work-related musculoskeletal disorders in home care nurses: study of the main risk factors. *Int J Ind Ergonom*. 2017;61:22-8. [Crossref]
- Bork BE, Cook TM, Rosecrance JC, Engelhardt KA, Thomason ME, Wauford IJ, et al. Work-related musculoskeletal disorders among physical therapists. *phys Ther*. 1996;76(8):827-35. [Crossref] [PubMed]
- 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. [Crossref] [PubMed]
- Adegoke BO, Akodu AK, Oyeyemi AL. Work-related musculoskeletal disorders among Nigerian physiotherapists. *BMC Musculoskelet Disord*. 2008;9:112. [Crossref] [PubMed] [PMC]
- Salik Y, Ozcan A. Work-related musculoskeletal disorders: a survey of physical therapists in Izmir-Turkey. *BMC Musculoskelet Disord*. 2004;5:27. [Crossref] [PubMed] [PMC]
- Iqbal Z, Alghadir A. prevalence of work-related musculoskeletal disorders among physical therapists. *Med pr*. 2015;66(4):459-69. [Crossref] [PubMed]

12. potter M, Jones S. Entry-level physiotherapists' strategies to lower occupational injury risk in physiotherapy: a qualitative study. *physiother Theory pract.* 2006;22(6):329-36.[Crossref] [PubMed]
13. Darragh AR, Campo M, King p. Work-related activities associated with injury in occupational and physical therapists. *Work.* 2012;42(3): 373-84. [Crossref] [PubMed] [PMC]
14. Bae YH. Relationships between presenteeism and work-related musculoskeletal disorders among physical therapists in the Republic of Korea. *Int J Occup Saf Ergon.* 2018;24(3): 487-92.[Crossref] [PubMed]
15. Caragianis S. The prevalence of occupational injuries among hand therapists in Australia and New Zealand. *J Hand Ther.* 2002;15(3): 234-41.[Crossref] [PubMed]
16. Mierzejewski M, Kumar S. prevalence of low back pain among physical therapists in Edmonton, Canada. *Disabil Rehabil.* 1997;19(8): 309-17. [Crossref] [PubMed]
17. West DJ, Gardner D. Occupational injuries of physiotherapists in North and Central Queensland. *Aust J physiother.* 2001;47(3):179-86.[Crossref] [PubMed]
18. Holder NL, Clark HA, DiBlasio JM, Hughes CL, Scherpf JW, Harding L, et al. Cause, prevalence, and response to occupational musculoskeletal injuries reported by physical therapists and physical therapist assistants. *phys Ther.* 1999;79(7):642-52.[Crossref] [PubMed]
19. Cromie JE, Robertson VJ, Best MO. Occupational health and safety in physiotherapy: guidelines for practice. *Aust J physiother.* 2001;47(1):43-51.[Crossref] [PubMed]
20. Cromie JE, Robertson VJ, Best MO. Work-related musculoskeletal disorders and the culture of physical therapy. *phys Ther.* 2002;82(5):459-72.[Crossref] [PubMed]
21. Rugelj D. Low back pain and other work-related musculoskeletal problems among physiotherapists. *Appl Ergon.* 2003;34(6):635-9. [Crossref] [PubMed]
22. 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.[Crossref] [PubMed] [PMC]
23. King p, Huddleston W, Darragh AR. Work-related musculoskeletal disorders and injuries: differences among older and younger occupational and physical therapists. *J Occup Rehabil.* 2009;19(3):274-83.[Crossref] [PubMed]
24. Alexopoulos EC, Stathi IC, Charizani F. prevalence of musculoskeletal disorders in dentists. *BMC Musculoskelet Disord.* 2004;5:16.[Crossref] [PubMed] [PMC]
25. Aptel M, Aublet-Cuvelier A, Cnockaert JC. Work-related musculoskeletal disorders of the upper limb. *Joint Bone Spine.* 2002;69(6):546-55.[Crossref] [PubMed]
26. Buckle pW, Devereux JJ. The nature of work-related neck and upper limb musculoskeletal disorders. *Appl Ergon.* 2002;33(3):207-17.[Crossref] [PubMed]
27. Vieira ER, Schneider p, Guidera C, Gadotti IC, Brunt D. Work-related musculoskeletal disorders among physical therapists: A systematic review. *J Back Musculoskelet Rehabil.* 2016;29(3):417-28.[Crossref] [PubMed]
28. passier L, Mcphail S. Work related musculoskeletal disorders amongst therapists in physically demanding roles: qualitative analysis of risk factors and strategies for prevention. *BMC Musculoskelet Disord.* 2011;12:24. [Crossref] [PubMed] [PMC]