ORIGINAL PAPER

Physiotherapy Quarterly (ISSN 2544-4395)
2022, 30(4), 59–64

Work-related musculoskeletal disorders among employees with different tasks: an Ahlia University case study

DOI: https://doi.org/10.5114/pq.2022.121146

Sayed A. Tantawy[1,2], Batool Al Halwachi[1], Amina Al Ghanim[1], Ahmed Al Mansoori[1], Dalia M. Kamel[3]
[1] Department of Physiotherapy, College of Medical & Health Sciences, Ahlia University, Manama, Kingdom of Bahrain
[2] Centre of Radiation Oncology and Nuclear Medicine, Cairo University, Giza, Egypt
[3] Department of Physical Therapy for Women's Health, Faculty of Physical Therapy, Cairo University, Giza, Egypt

Abstract

Introduction. The study aim was to investigate the prevalence of work-related musculoskeletal disorders (MSDs) and to determine the relationship between work-related MSDs and body mass index (BMI) among employees of Ahlia University, Kingdom of Bahrain.
Methods. Overall, 200 subjects, both men and women, aged 22–56 years, were included in the study over a period of 1 year. Demographic data, such as age, nationality, gender, marital status, occupation, as well as height, weight, and BMI were collected. All participants filled in the Nordic Musculoskeletal Questionnaire.
Results. The study revealed that low back pain had the highest prevalence at both 12 months and 7 days (44.5% and 31.5%, respectively). It was followed by neck pain (40% and 23.5%, respectively) in the same time intervals. The work-related MSDs were correlated with all demographic characteristics, except the nationality. Despite that BMI presented a negative correlation with neck, wrist/hand, and knee symptoms, it showed a positive correlation with MSDs in other body parts, but all those correlations were insignificant.
Conclusions. Workplace influenced work-related MSDs development among Ahlia University employees. Low back pain and neck pain exhibited the highest prevalence among MSDs of particular body parts. Work-related MSDs were significantly correlated with occupation, number of years in the job, and age, while no significant correlation with BMI was observed.
Key words: musculoskeletal disorders, body mass index, Nordic Musculoskeletal Questionnaire, occupation, obesity

Introduction

Musculoskeletal disorders (MSDs) are defined as connective tissue or musculoskeletal diseases that cause muscle pain or injuries from sudden or sustained contact with repetitive motion, force, vibration, or wrong postural movement. MSDs involve injuries or disorders to the muscles, joints, tendons, cartilage, nerves, and spinal area of the upper limbs and lower limbs, neck, and lower back [1, 2].

The most common MSDs are muscle soreness, strain, carpal tunnel syndrome, low back pain, sprain, and connective tissue injury caused by force or trauma [2]. MSDs are the largest occupational problem, which accounts for about 1/3 of all the registered occupational diseases, and they are also considered the most common work-related health problem in Europe, United States of America, and Asia [3].

Work-related MSDs among hospital nurses were investigated in Ajman, United Arab Emirates. The study showed that 39% of the nurses had work-related MSDs. After 1 year of the research, it was documented that 38% exhibited MSDs in any part of the body. The most common area was the lower back (29%), followed by ankle (20%) [4].

Worldwide, MSDs are the second most common reason for disability, with low back pain as patients' frequent complaint [5].

Yasobant and Rajkumar [6] reported that work-related MSDs were accountable for morbidity in the majority of the working population and constituted a known occupational problem, characterized as multifactorial. They implied that work-related MSDs were associated with the cost of 215 billion dollars in the USA in 1995, 38 billion euros in Germany in 2002, and 26 billion Canadian dollars in Canada in 1998.

When left untreated, MSDs can develop into more serious and inflammatory conditions, which can have a negative impact on the workers' activities of daily living [7].

MSDs are more prevalent in employees who work with a computer and complain of pain in the shoulders, neck, upper limbs, and low back. Sedentary work, but also body mass index (BMI) are factors contributing to the development of MSDs [8]. The MSDs risk factors also include age, sex, occupation, smoking, work stress, heavy weightlifting [9]. Also, workplace psychosocial factors can contribute to the development of MSDs [10]. MSDs resulting in chronic disability affect the individuals' activities of daily living [8].

However, MSDs are commonly neglected owing to the demand of work and the need for an individual to complete the daily task in order to keep up with their current job. Where symptoms of MSDs are more evident, the progression of MSDs depends on the person's occupation.

Employees in Ahlia University are prone to the development of MSDs like any other employees in any other organization. The aim of the present study was to investigate the prevalence of MSDs among Ahlia University workers and to determine the relationship between MSDs and BMI, type of job, age, gender, nationality, marital status, and number of years in the job.

Correspondence address: Sayed A. Tantawy, Department of Physiotherapy, College of Medical & Health Sciences, Ahlia University, Manama, Kingdom of Bahrain, P.O. Box 10878, e-mail: tantawyss@yahoo.com, https://orcid.org/0000-0002-7676-7764

Received: 20.04.2020
Accepted: 15.11.2020

Citation: Tantawy SA, Halwachi BA, Ghanim AA, Mansoori AA, Kamel DM. Work-related musculoskeletal disorders among employees with different tasks: an Ahlia University case study. Physiother Quart. 2022;30(4):59–64; doi: https://doi.org/10.5114/pq.2022.121146.

Subjects and methods

Subjects

The study included a convenient sample of 200 subjects, both men and women, from Ahlia University employees, aged 22–56 years. Demographic data, such as age, nationality, gender, marital status, occupation, as well as height, weight, and BMI were collected. The study was conducted between May 2017 and May 2018.

Included were subjects who had been full-time employees at Ahlia University for more than 1 year, males and females aged 22–56 years, working for more than 7 hours a day.

Participants with a previous trauma or injury, a history of surgery, a history of a psychological problem, severe physical disability causing pain, or any medical condition causing pain were excluded from the study.

Study design

A descriptive cross-sectional study was performed that investigated the prevalence of MSDs among Ahlia University employees and the relationship of MSDs with BMI.

All participants were given a questionnaire that included 2 parts: a demographic section and the Nordic Musculoskeletal Questionnaire. Then, weight and height were measured and BMI was computed. The data used in the study included name, age, gender, nationality, marital status, occupation, number of years in the job, weight, height, and BMI.

The Nordic Musculoskeletal Questionnaire was applied to assess any locomotive problems in the body. There are 2 sections of the questionnaire: one with general questions, including 40 forced-choice items regarding the areas of the body affected by MSDs symptoms or problems. There are 9 symptom sites: the neck, shoulders, elbows, wrists/hands, upper back, lower back, hips/thighs, knees, and ankles/feet. All the participants were asked if within the previous 12 months and the previous 7 days they had experienced MSDs symptoms potentially causing any problem while doing their work. The second section is an additional one if the answer is YES. It includes 25 forced-choice questions about factors that may produce injury or accidents in the affected area. These can have a functional impact at work, home, or both. The questionnaire also assesses the duration of the symptom or problem and if the respondent had any consultation with a health care professional within the previous 7 days. This standardized questionnaire was used because it is widely applied in research regarding MSDs owing to its validity and reliability [11, 12].

Moreover, the Nordic Musculoskeletal Questionnaire can detect or screen any MSDs problem. Some participants may not know that they had MSDs and may not have consulted any health care professional.

BMI was computed on the basis of the weight and height of each participant. According to the World Health Organization, BMI classification is a simple way to determine underweight, normal weight, overweight, and obesity. BMI is defined as weight in kilograms divided by height in meters squared (kg/m^2). The values are in accordance with age for both males and females.

All information collected from the participants is strictly confidential. All subjects had the right to withdraw at any time from participating in this study.

Sample size estimation

The sample size was estimated by using Cochran's sample size formula [13]. The required sample size was 181 for collecting valid data. With the consideration of a 10% drop-out rate, the current study involved 200 participants.

Statistical analysis

All questionnaires that were completed were included in the statistical analysis. The Statistical Package for the Social Sciences (SPSS) (version 23, IBM Corp., Armonk, NY, USA) was used to analyse the mean, standard deviation, and percentage of age, nationality, gender, occupation, number of years in job, marital status, and BMI. The Shapiro-Wilk test was conducted to assess the normality of data distribution. Furthermore, the percentage of the most common sites of MSDs was analysed. Pearson's correlation served to test the correlation between MSDs and the subjects' characteristics. The level of significance was set at the value of $p < 0.05$ for all statistical analyses.

Ethical approval

The research related to human use has complied with all the relevant national regulations and institutional policies, has followed the tenets of the Declaration of Helsinki, and has been approved by the Ethical and Research Subcommittee of the Academic Research and Intellectual Contribution Committee, Ahlia University.

Informed consent

Informed consent has been obtained from all individuals included in this study.

Results

A total of 200 participants, 106 (53%) men and 94 (47%) women, were included in this study. The majority of the subjects (60 [30%]) were in the age group of 32–36 years. The least number (7 [3.5%]) represented the age group of 47–51 years, as shown in Table 1.

The analysis showed that most of the participants were married (123 [61.5%]), while only 4 (2%) were divorced. A total of 103 (51.5%) of the subjects in this study were office workers, whereas only 1 (0.5%) was an office boy and 1 (0.5%) worked in the management (Table 1); 45.5% had been working for 1–5 years only while merely 9% had been working for more than 15 years.

Regarding BMI, the study revealed 47.5% were in the normal BMI range of 18.5–24.9 (Table 1), while only 1% were in the obesity class III. The mean BMI value was 24.8 with a standard deviation of 4.5.

The majority of the participants working in Ahlia University were Bahraini (138 [69%]), while only 0.5% where Gambian, Sri Lankan, Lebanese, Nigerian, Chinese, Saudi, North American, or Kenyan each (Table 2).

The 12-month prevalence of MSDs was found to be 44.5% with low back pain, while only 16% for one or both hips/thighs. During the previous 12 months, most of the participants presented low back pain which had prevented them from doing normal work, whereas only 6% had elbow pain. The majority of the participants (31.5%) exhibited low back pain, followed by neck pain (23.5%), during the previous 7 days, while only 5.5% had elbow pain (Table 3).

MSDs showed a significant correlation ($p < 0.05$) with the demographic characteristics of age, gender, marital sta-

Table 1. The participants' characteristics

Characteristics	Frequency
Gender	
Male	106 (53%)
Female	94 (47%)
Age (years)	
22–26	51 (25.5%)
27–31	39 (19.5%)
32–36	60 (30%)
37–41	14 (7%)
42–46	21 (10.5%)
47–51	7 (3.5%)
52–56	8 (4%)
BMI	
Underweight	7 (3.5%)
Normal	95 (47.5%)
Overweight	69 (34.5%)
Obese	29 (14.5%)
Marital status	
Married	123 (61.5%)
Single	73 (36.5%)
Divorced	4 (2%)
Occupation	
Cleaner	14 (7%)
IT	3 (1.5%)
Management	1 (0.5%)
Office boy	1 (0.5%)
Office worker	103 (51.5%)
Security	27 (13.5%)
Teacher	51 (25.5%)

BMI – body mass index, IT – information technology

Table 2. Nationality distribution of the participants

Nationality	Number	Percentage
Bahraini	138	69
Indian	23	11.5
Filipino	7	3.5
Pakistani	4	2
Bangladeshi	9	4.5
Kenyan	1	0.5
Iraqi	2	1
Egyptian	2	1
Gambian	1	0.5
Sri Lankan	1	0.5
Lebanese	1	0.5
Nigerian	1	0.5
Chinese	1	0.5
Saudi	1	0.5
Nepali	5	2.5
North American	1	0.5
Tunisian	2	1

tus, occupation, and number of years in the job, while there was a non-significant correlation ($p > 0.05$) with nationality (Table 4).

The summarized results of the correlation analysis between BMI and MSDs symptoms are illustrated in Table 5. Overall, the correlations between BMI and the symptoms experienced by the respondents in all of the body parts covered by the survey were insignificant ($p > 0.05$). Although BMI had a negative correlation with neck, wrist/hand, and knee for the period of the previous 12 months ($p = 0.60$, $r = –0.053$; $p = 0.52$, $r = –0.065$; $p = 0.49$, $r = –0.071$, respectively) and

Table 3. Prevalence of MSDs among Ahlia University employees

Characteristics		Neck	Shoulder	Elbow	Wrist/ hand	Upper back	Lower back	Hip	Knee	Ankle/ foot
12-month prevalence	%	40	29	9	24.5	27.5	44.5	16	24.5	17.5
	n	80	58	18	49	55	89	32	49	35
Severity of MSDs to affect ADL	%	23.5	22	6	18	21	32	10.5	17	11.5
	n	47	44	12	36	42	64	21	34	23
7-day prevalence	%	23.5	20	5.5	20.5	19	31.5	10.5	15.5	13.5
	n	47	40	11	41	38	63	21	31	27

MSDs – musculoskeletal disorders, ADL – activities of daily living

Table 4. Pearson's correlation between MSDs and age, gender, nationality, marital status, occupation, and number of years in the job

		Age	Gender	Nationality	Marital status	Occupation	Number of years in job
MSDs	*r*	0.46	0.61	0.18	0.32	0.79	0.86
	p	0.043	0.046	0.061	0.044	0.028	0.037

MSDs – musculoskeletal disorders

Table 5. Relationship between BMI and MSDs

Body parts	12-month prevalence		Severity of MSDs to affect ADL		7-day prevalence	
	r	*p*	*r*	*p*	*r*	*p*
Neck	–0.05	0.60	–0.06	0.51	–0.09	0.35
Shoulder	0.09	0.35	0.14	0.15	0.07	0.47
Elbow	0.04	0.67	0.08	0.38	0.04	0.66
Wrist/hand	–0.06	0.52	–0.02	0.85	–0.07	0.44
Upper back	0.01	0.86	0.02	0.83	0.01	0.90
Lower back	0.03	0.76	0.02	0.80	–0.14	0.14
Hip	0.01	0.86	–0.03	0.70	0.03	0.77
Knee	–0.07	0.49	0.03	0.76	0.05	0.62
Ankle/foot	0.03	0.70	0.05	0.58	0.04	0.64

BMI – body mass index, MSDs – musculoskeletal disorders, ADL – activities of daily living

a positive correlation with the other body parts, all those correlations did not reach the significance level of $p > 0.05$. Similar observations referred to the correlation between BMI and symptoms for the period of the previous 7 days (Table 5).

Normality test was applied for all variables by using the Shapiro-Wilk test. All variables showed normal distribution in both groups ($p > 0.05$).

Discussion

The present study was the first to investigate the prevalence of MSDs among Ahlia University workers and to determine the relationship between MSDs and BMI, type of job, age, gender, nationality, marital status, and number of years in the job. Therefore, there are no data with which to directly compare the results.

The current study revealed no significant correlation between BMI and MSDs development among the workers. These results contradict many studies [14–22] which stated a positive association between BMI and MSDs, especially among office workers with physical workload. Furthermore, a previous study by Tantawy et al. [23] showed a consistent result of a non-significant correlation between MSDs and BMI among Ahlia University students in different disciplines. The current study findings can be attributed to the fact that the majority of participants (48%) had normal BMI and developed MSDs, so a high BMI not necessarily constitutes an indicator of MSDs development. There was no much difference among the participants with MSDs with normal BMI (48%) versus overweight ones (35%), which only supports the explanation mentioned earlier.

The majority of participants in the present study had experienced low back pain during the previous 12 months (44.5%) and the previous 7 days (31.5%). These disorders caused trouble while working among the subjects. This is consistent with a study by Kaliniene et al. [8], who stated that the majority of respondents had low back pain (56.1%). Eastern Mediterranean Region inhabitants presented a higher risk of low back pain than of pain in other body parts [24]. This is supported with the described 50% of low back pain among construction workers in Saudi Arabia [25] and 30.3% among bank workers in Kuwait [26].

The second most commonly affected site of the body was the neck, which accounted for 40% and 23.5% of MSDs cases during the previous 12 months and the previous 7 days, respectively. This contradicts observations by Hayes et al. [27], who revealed neck pain to be most prevalent (64.3%), followed by low back pain (57.9%), among dental hygiene students in Australia. Similarly, Abledu and Offei [28] demonstrated a 28% prevalence of neck pain and only a 23.6% prevalence of low back pain among nursing students.

Regarding age groups, the biggest age group presenting with MSDs was that of 32–36 years (30%). This is the majority age group of the working population for both Kuwait and Bahrain [26]. This highlights an important issue as MSDs due to working environment may be developed at an early age.

In the present study, 53% of the participants were men and only 47% were women. This is in contradiction with other studies, which stated that a higher prevalence of MSDs was found among women than among men, in either students or workers and in different parts of the world [29–31]. This inconsistency can be attributed to gender representation in particular studies: there were many female workers but in Bahrain, the majority of workers were male.

Most participants who reported MSDs were office workers (52%) and this is supported by many studies [8, 26, 32], which demonstrated the same workplace to be a major contributor to MSDs development, especially when dealing with a computer for a long time [8, 32]. This is because of the prolonged sitting position and a high risk of faulty postures and stressing over different body parts.

Studies involving health care professionals such as doctors and nurses [6, 33] mention that their job requires standing or bending most of the time while attending patients; therefore, they can develop MSDs throughout the period of work.

A possible explanation for the lack of correlation between the variables in any given part of the body may have been that weight is not a significant factor in this study that can cause work-related MSDs among office workers. Likewise, the length of time that office workers spend at work may be a reason why no association or relationship was noted in the study. Despite the aforementioned lack of correlation, the highest percentage of low back pain reported among the participants must be highlighted. Further physiotherapeutic examination along with other validated questionnaires, such as Functional Pain Index, can be used for subjects with low back pain for qualification to prevention programs [34].

It may be indicated that office habits involving working for a prolonged period may not be a contributory factor in MSDs development. It may also be true that office workers

do other things such as taking frequent walks during their task periods and hence the occurrence of MSDs is not yet fully evident. Besides, the respondents may have taken frequent breaks during their work. Moreover, the length of time devoted to office work tasks can be a contributory factor. The results may denote that the majority of the workers did not work continuously within a day, unlike suggested in other studies in the literature review. The nature of the tasks in the office is also a contributory factor to why associations were not established. Office work tasks may be very light and hence the development of symptoms was not fully reported in different body parts.

Limitations

The limitations of the study include the use of a self-reported questionnaire, which is affected by the subject status and a recall bias. Moreover, physical activity level was not involved in the study, and there was an unequal number of females and males.

Conclusions

Low back pain and neck pain were the most common MSDs among workers, who were mostly administrative staff. This highlights the importance of an ergonomic intervention to adjust the workstation, which was supported with the significant correlation of MSDs with the occupation, age, and the number of years in work.

Acknowledgements

The authors would like to thank the students of Ahlia University for their participation in the study.

Disclosure statement

No author has any financial interest or received any financial benefit from this research.

Conflict of interest

The authors state no conflict of interest.

References

1. Punnett L, Wegman DH. Work-related musculoskeletal disorders: the epidemiologic evidence and the debate. J Electromyogr Kinesiol. 2004;14(1):13–23; doi: 10.1016/j.jelekin.2003.09.015.
2. Da Costa BR, Vieira ER. Risk factors for work-related musculoskeletal disorders: a systematic review of recent longitudinal studies. Am J Ind Med. 2010;53(3):285–323; doi: 10.1002/ajim.20750.
3. Hauke A, Flintrop J, Brun E, Rugulies R. The impact of work-related psychosocial stressors on the onset of musculoskeletal disorders in specific body regions: a review and meta-analysis of 54 longitudinal studies. Work Stress. 2011;25(3):243–256; doi: 10.1080/02678373.2011.614069.
4. Gopal K, Thomas M, Sreedharan J. Work-related musculoskeletal disorders (WMSD) in hospital nurses: prevalence and coping strategies. Gulf Med J. 2012;1(S1):159–163.
5. Storheim K, Zwart J-A. Musculoskeletal disorders and the Global Burden of Disease study. Ann Rheum Dis. 2014;73(6):949–950; doi: 10.1136/annrheumdis-2014-205327.
6. Yasobant S, Rajkumar P. Work-related musculoskeletal disorders among health care professionals: a cross-sectional assessment of risk factors in a tertiary hospital, India. Indian J Occup Environ Med. 2014;18(2):75–81; doi: 10.4103/0019-5278.146896.
7. Ng A, Hayes MJ, Polster A. Musculoskeletal disorders and working posture among dental and oral health students. Healthcare. 2016;4(1):13; doi: 10.3390/healthcare4010013.
8. Kaliniene G, Ustinaviciene R, Skemiene L, Vaiciulis V, Vasilavicius P. Associations between musculoskeletal pain and work-related factors among public service sector computer workers in Kaunas County, Lithuania. BMC Musculoskelet Disord. 2016;17(1):420; doi: 10.1186/s12891-016-1281-7.
9. Wang SY, Liu LC, Lu MC, Koo M. Comparisons of musculoskeletal disorders among ten different medical professions in Taiwan: a nationwide, population-based study. PLoS One. 2015;10(4):e0123750; doi: 10.1371/journal.pone.0123750.
10. Barr AE, Barbe MF, Clark BD. Work-related musculoskeletal disorders of the hand and wrist: epidemiology, pathophysiology, and sensorimotor changes. J Orthop Sports Phys Ther. 2004;34(10):610–627; doi: 10.2519/jospt.2004.34.10.610.
11. Kuorinka I, Jonsson B, Kilbom A, Vinterberg H, Biering-Sørensen F, Andersson G, et al. Standardised Nordic questionnaires for the analysis of musculoskeletal symptoms. Appl Ergon. 1987;18(3):233–237; doi: 10.1016/0003-6870(87)90010-x.
12. Dickinson CE, Campion K, Foster AF, Newman SJ, O'Rourke AM, Thomas PG. Questionnaire development – an examination of the Nordic Musculoskeletal Questionnaire. Appl Ergon. 1992;23(3):197–201; doi: 10.1016/0003-6870(92)90225-k.
13. Bartlett JE II, Kotrlik JW, Higgins CC. Organizational research: determining appropriate sample size in survey research. Inf Technol Learn Perform J. 2001;19(1):43–50.
14. Sethi J, Sandhu JS, Imbanathan V. Effect of body mass index on work related musculoskeletal discomfort and occupational stress of computer workers in a developed ergonomic setup. Sports Med Arthrosc Rehabil Ther Technol. 2011;3(1):22; doi: 10.1186/1758-2555-3-22.
15. Hooper MM, Stellato TA, Hallowell PT, Seitz BA, Moskowitz RW. Musculoskeletal findings in obese subjects before and after weight loss following bariatric surgery. Int J Obes. 2007;31(1):114–120; doi: 10.1038/sj.ijo.0803349.
16. Anandacoomarasamy A, Caterson I, Sambrook P, Fransen M, March L. The impact of obesity on the musculoskeletal system. Int J Obes. 2008;32(2):211–222; doi: 10.1038/sj.ijo.0803715.
17. Bell LM, Byrne S, Thompson A, Ratnam N, Blair E, Bulsara M, et al. Increasing body mass index z-score is continuously associated with complications of overweight in children, even in the healthy weight range. J Clin Endocrinol Metab. 2007;92(2):517–522; doi: 10.1210/jc.2006-1714.
18. Geoghegan JM, Clark DI, Bainbridge LC, Smith C, Hubbard R. Risk factors in carpal tunnel syndrome. J Hand Surg Br. 2004;29(4):315–320; doi: 10.1016/j.jhsb.2004.02.009.
19. Singh J, Kocher G, Lal H. Musculoskeletal disorder among workers in small scale forging industry. Int J Appl Res Mech Eng. 2013;2(3):10; doi: 10.47893/IJARME.2013.1086.
20. Noroozi MV, Hajibabaei M, Saki A, Memari Z. Prevalence of musculoskeletal disorders among office workers.

Jundishapur J Health Sci. 2015;7(1):e27157; doi: 10.5812/jjhs.27157.
21. Viester L, Verhagen EALM, Oude Hengel KM, Koppes LLJ, van der Beek AJ, Bongers PM. The relation between body mass index and musculoskeletal symptoms in the working population. BMC Musculoskelet Disord. 2013;14:238; doi: 10.1186/1471-2474-14-238.
22. Choi W-J, Kang Y-J, Kim J-Y, Han S-H. Symptom prevalence of musculoskeletal disorders and the effects of prior acute injury among aging male steelworkers. J Occup Health. 2009;51(3):273–282; doi: 10.1539/joh.o8025.
23. Tantawy SA, Abdul Rahman A, Abdul Ameer M. The relationship between the development of musculoskeletal disorders, body mass index, and academic stress in Bahraini University students. Korean J Pain. 2017;30(2):126–133; doi: 10.3344/kjp.2017.30.2.126.
24. 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(8):1365–1373; doi: 10.1136/annrheumdis-2016-210146.
25. Alghadir A, Anwer S. Prevalence of musculoskeletal pain in construction workers in Saudi Arabia. ScientificWorldJournal. 2015;2015:529873; doi: 10.1155/2015/529873.
26. Akrouf QAS, Crawford JO, Al-Shatti AS, Kamel MI. Musculoskeletal disorders among bank office workers in Kuwait. East Mediterr Health J. 2010;16(1):94–100; doi: 10.26719/2010.16.1.94.
27. Hayes MJ, Smith DR, Cockrell D. Prevalence and correlates of musculoskeletal disorders among Australian dental hygiene students. Int J Dent Hyg. 2009;7(3):176–181; doi: 10.1111/j.1601-5037.2009.00370.x.
28. Abledu JK, Offei EB. Musculoskeletal disorders among first-year Ghanaian students in a nursing college. Afr Health Sci. 2015;15(2):444–449; doi: 10.4314/ahs.v15i2.18.
29. Wijnhoven HAH, de Vet HCW, Picavet HSJ. Prevalence of musculoskeletal disorders is systematically higher in women than in men. Clin J Pain. 2006;22(8):717–724; doi: 10.1097/01.ajp.0000210912.95664.53.
30. Ekpenyong CE, Daniel NE, Aribo EO. Associations between academic stressors, reaction to stress, coping strategies and musculoskeletal disorders among college students. Ethiop J Health Sci. 2013;23(2):98–112; doi: 10.4314/EJHS.V23I2.
31. Kortt M, Baldry J. The association between musculoskeletal disorders and obesity. Aust Health Rev. 2002;25(6):207–214; doi: 10.1071/ah020207.
32. Wahlström J. Ergonomics, musculoskeletal disorders and computer work. Occup Med. 2005;55(3):168–176; doi: 10.1093/occmed/kqi083.
33. Munabi IG, Buwembo W, Kitara DL, Ochieng J, Nabirye RC, Mwaka ES. Musculoskeletal disorders among nursing staff: a comparison of five hospitals in Uganda. Pan Afr Med J. 2014;17:81; doi: 10.11604/pamj.2014.17.81.3213.
34. Wiśniewski E, Zubrzycka A, Wroński Z, Hadamus A. Qualification for prevention of musculoskeletal diseases. Low back pain example. Adv Rehab. 2018;4:13–19; doi: 10.5114/areh.2018.83390.