Frequency and Risk Factors Associated with Musculoskeletal Pain among the Medical Students of Rawalpindi

Aliya Hisam, Syed Fawad Mashhadi, Amna Kaneez Fatima Raja, Muhammad Ameer Hamza, Rida Sabir,
Tahoora Naveed, Muhammad Umer

Army Medical College/National University of Medical Sciences (NUMS) Rawalpindi Pakistan

ABSTRACT

Objective: To find the frequency and risk factors associated with musculoskeletal pain (MSP) among the medical students of Rawalpindi.

Study Design: Analytical cross-sectional study

Place and Duration of Study: Army Medical College students, Rawalpindi Pakistan, were enrolled from Mar 2022 to Jul 2022.

Methodology: An online, self-administered, altered version of the standardized Nordic Questionnaire was distributed among the students of Army Medical College, Foundation Medical University and Rawalpindi Medical University. Data were analyzed using IBM SPSS-25. Frequencies and means were calculated. Chi-square test and student's t test were done to find any significant associations with *p*-value <0.05 taken as statistically significant.

Results: The study population consisted of 371 medical students of which 127(34.2%) were males and 244(65.8%) were females. Musculoskeletal pain prevalence reported in the last week was significantly higher in students of clinical years (*p*=0.008), those with history of trauma (*p*=0.005), family history of musculoskeletal pain (*p*<0.001) and those with a higher screen time (*p*=0.007). Similarly, musculoskeletal pain prevalence reported in the last year was significantly higher in students of clinical years (*p*=0.003), those with a history of trauma (*p*=0.004), family history of musculoskeletal pain (*p*=0.011) and those with higher screen time (*p*=0.017). Coffee consumption, hours of study and body mass index had no significant association with musculoskeletal pain prevalence.

Conclusion: Musculoskeletal pain prevalence proved to be significantly high among the medical students of Rawalpindi. Awareness needs to be spread about this highly prevalent problem with medical colleges taking steps to reduce the contributing factors.

Keywords: Back pain, Musculoskeletal pain, Medical students, Occupational hazard.

INTRODUCTION

Musculoskeletal pain (MSP) is defined as any aching, painful, numb sensations or those causing discomfort in the muscles, bones, ligaments, tendons, and nerves of the respective regions.[1] With lower back pain being the most prevalent.[2] Many cases of musculoskeletal pain are associated with overuse of muscles, ligaments etc. at work. Being a common occupational hazard, Centre for Disease Control and Prevention (CDC) mentions the definition of work-related musculoskeletal disorders (WMSD) as "disorders where the working conditions and the execution of the job contributes to and/or worsens the disorder".[3] Healthcare workers are no exception with musculoskeletal pain being a leading complaint reported.[1] Note-worthy is the fact that musculoskeletal pain also affects the young population and university students. Medical students are subjected to triggering physical and psychological factors for example long clinical training hours, stress, prolonged computer use, a sedentary lifestyle, inadequate sleep and heavy backpacks to name a few.[4-6] While the primary goal of medical school is to produce capable doctors who ensure the health of society there is often a compromise on the wellbeing of the students themselves. Many research studies illustrated a high incidence of musculoskeletal pain in medical students. In an Austrian medical school more than half of the students reported lower back pain. It also seems that the higher years of study tend to suffer from a higher prevalence of musculoskeletal pain because of the long hours of handson training in the hospital.[6] A study conducted at a Malaysian medical college reported a link between musculoskeletal pain and a history of injury, screen time and clinical years.[7] Another recent study conducted at Taif University found that stress was a main factor associated with pain reported by students.[8]

There have been very few studies investigating musculoskeletal pain within the medical student

Correspondence: Dr Aliya Hisam, Department of Community Medicine, Army Medical Sciences, Rawalpindi, Pakistan

population of Pakistan. Despite the high prevalence an encouraging sign is that many of these factors are modifiable and can be addressed. Musculoskeletal pain clearly results in debility, hampers the productivity and results in absenteeism from lectures and clinics resulting in a detrimental effect on the career of future health-care providers.[9]

This study aims to assess the frequency and risk factors associated with musculoskeletal pain among the medical students of Rawalpindi. To investigate whether medical school authorities need to take actions to prevent development of musculoskeletal pain. This first step will form the basis on which students and college authorities can then work together to introduce, implement and inculcate the required changes to reduce the identifies risk factors.

METHODOLOGY

This was a descriptive cross-sectional study, conducted in three medical college in Rawalpindi: Army Medical College, Rawalpindi Medical University and Foundation Medical University, Rawalpindi Pakistan, from March to July, 2021. Sample size needed was 341 medical students from (first to final year MBBS) from an approximated population of 3000 students to ensure a confidence level of 95% and a confidence interval of 5 as calculated by the WHO sample size calculator. Non-probability convenience sampling was carried out.

Inclusion Criteria: included all medical students from first to final year who were eligible to participate.

Exclusion Criteria: included any joint disease.

The questionnaire used was a modified version of the standardized Nordic Questionnaire.[9] Which consisted of three parts. Section-A consisted of questions on socio-demographic data. Section-B consisted of questions on the risk factors of musculoskeletal pain. Section-C consisted of questions on the occurrence of pain in the neck, shoulders and low back during the past 7 days and the past 12 months.

After obtaining consent, a structured online self-administered questionnaire was distributed via Google Forms. Non-probability convenience sampling was carried out and the sample subjects were included on the basis of accessibility. The confidentiality of participants was maintained throughout the process

Data was entered on SPSS version 25. Descriptive analysis assessing frequencies of risk factors in the musculoskeletal pain and the non-musculoskeletal pain groups was carried out. Student's t test and Chi squared test was used to assess the relationship between the dependent and independent variables. The independent variables being gender and academic year. Whereas the dependent variables include history of trauma, family history of musculoskeletal pain, heavy backpack, exercise, coffee consumption, screen time, study hours, sleep hours and body mass index. A $p<0.05$ was considered as significant.

RESULTS

The study consisted of 371 participants, of which 127(34.2%) were males and 244(65.8%) were females. 230(62.0%) participants belonged to Army Medical College, 80(21.6%) to Foundation Medical University and 61(16.4%) to Rawalpindi Medical University. Mean age of students was 20.66±1.83 years (Figure-1).
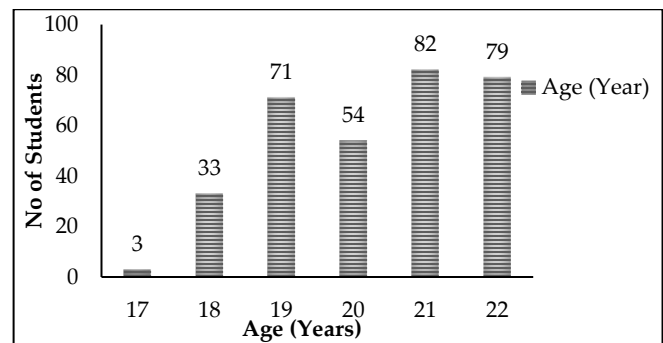

Figure-1: Frequency Histogram of Age distribution of Study Population

Among the study population, the majority that is 144(38.8%) students belonged to the fourth year, 96 students (25.9%) belonged to the first year, 54(14.5%) students were from the second year and 44(11.9%) students from the third year. The percentage of final year students, 33(8.9%), taking part in the study was the least. (Figure-2)
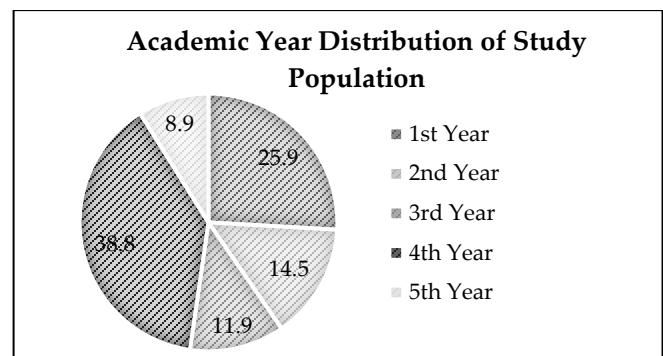

Figure-2: Academic Year Distribution of Study Population

Out of the total participants 64.4% students reported of musculoskeletal pain in past year (Figure-3)

whereas only 34.0% students reported musculoskeletal pain in last week (Figure-4).

Figure-3: Musculoskeletal pain prevalence in last 12 months

of musculoskeletal pain (OR=3.50 95%`C.I 1.99-6.17 $p<$ 0.001). Student's t test showed that prevalence of musculoskeletal pain reported in last week was significantly higher in students with higher screen time (p=0.007) (Table-I).
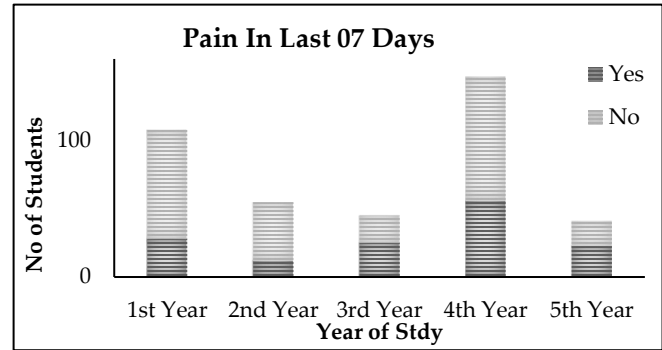

Figure-4: Musculoskeletal pain prevalence in last 7 days

Table-I: Factors related to Musculoskeletal Pain during the Past 7 days

Variables	Musculoskeletal pain during the past 7 days		Odds Ratio	95% CI	*p*-value
	Yes(%)	No(%)			
Gender					
Male	35(27.8)	91(72.2)	1.52	0.95-2.43	0.099
Female	90(36.9)	154(63.1)			
Academic Year					
Pre-clinical	39(26.0)	111(74.0)	1.85	1.17-2.91	0.008
Clinical	87(39.4)	134(60.6)			
History of Trauma					
Yes	29(50.0)	29(50.0)	2.23	1.26-3.93	0.005
No	97(31.0)	216(69.0)			
Family history of musculoskeletal pain					
Yes	36(59.0)	25(41.0)	3.50	1.99-6.17	0.000
No	90(29.1)	219(70.9)			
Heavy Backpack					
Yes	60(35.5)	109(64.5)	1.13	0.74-1.75	0.567
No	66(32.7)	136(67.3)			
Exercise					
Regularly	36(33.3)	72(66.7)	0.91	0.55-1.49	0.139
Not Regularly	65(31.3)	143(68.8)	1.67	0.86-3.24	
Not at All	25(45.5)	30(54.4)			
Coffee Consumption					
≥3 cups/week	21(34.4)	40(65.6)	1.25	0.68-2.29	0.061
≤ 3 cups/week	42(43.3)	55(56.7)	1.82	1.11-2.99	
Not at All	63(29.6)	50(70.4)			
Mean±SD					
	Mean±SD (Yes)	**Mean±SD (No)**			
Hours of Screen Time	6.69±3.17	5.80±2.76			0.007
Hours of Study	5.30±2.73	4.76±2.42			0.064
Hours of Sleep	8.80±1.94	8.68±1.63			0.530
Body Mass Index	22.22±4.40	21.55±5.80			0.260

Musculoskeletal pain prevalence reported in last week was significantly higher in students of clinical years as compared to pre-clinical years (OR=1.85, 95% C.I 1.17-2.91, p=0.008), those with history of trauma (OR=2.23, 95% C.I 1.26-3.93, p=0.005) and family history

Similarly, musculoskeletal prevalence reported in last year was significantly higher in students of clinical years as compared to preclinical years (OR=1.94, 95% C.I 1.26-2.99 p=0.003), those with history of trauma (OR=2.69, 95% C.I 1.34- 5.39 p=0.004) and family history

of musculoskeletal pain (OR=2.30, C.I 1.20- 4.43, *p*= 0.011). Students with higher screen time also had a higher prevalence of musculoskeletal pain (*p*=0.017).

However, there were certain differences seen. For example, there was no significant association between gender, hours of sleep, backpack weight or exercise and musculoskeletal pain reported in the last week. However, the hours of sleep in students with musculoskeletal pain in past year was significantly less (*p*=0.008) than those who did not report musculoskeletal pain during the same time period. musculoskeletal pain prevalence in the past year was also significantly higher in those with heavier back-packs (OR=1.71, 95 % C.I 1.11-2.64, *p*=0.015) and those who did not exercise (OR=2.76, C.I 1.31-5.81, *p*=0.023) musculoskeletal pain prevalence in last year was significantly higher in females than in males (OR=1.93, C.I 1.24-3.01, *p*=0.03). (Table-II). No significant association was seen between coffee consumption, hours spent in study and body mass index and musculoskeletal pain prevalence reported both in past week and past year.

DISCUSSION

The prevalence of musculoskeletal pain proved to be high among the medical students of Rawalpindi. Overall, students in their clinical years, those with higher screen time, increased backpack weight, lack of physical exercise, lack of hours of sleep, with a family history of musculoskeletal pain, with history of trauma reported musculoskeletal pain in at least one site (neck/shoulder/lower back). Body mass index (BMI), coffee consumption and hours of the study appeared to have no link with musculoskeletal pain.

Musculoskeletal pain (MSP) is a recognized outcome of constant exertion, overuse, and work-related musculoskeletal disorders. Symptoms arise from joints, bones, muscles or adjacent structures.[10] Musculoskeletal pain has unfortunately become an exceedingly common complaint in the health care system both at work and in the academic environment. It is a consequence of the required demands of the occupation and lifestyle of individuals.[11] It is an important cause of morbidity in university students.[12] In fact the sites investigated in our

Table-II: Factors related to Musculoskeletal Pain during the Past 12 months

Variables	Musculoskeletal pain during the past 12 Months		Odds Ratio	95% CI	*p*-value
	Yes(%)	No(%)			
Gender					
Male	69(54.3)	58(45.7)	1.93	1.24-3.01	0.003
Female	170(69.6)	74(30.3)			
Academic Year					
Pre-clinical	83(55.3)	67(44.7)	1.94	1.26-2.99	0.003
Clinical	156(70.6)	65(29.4)			
History of Trauma					
Yes	47(81.0)	11(19.0)	2.69	1.34-5.39	0.004
No	192(61.3)	121(38.7)			
Family History of MSP					
Yes	48(78.7)	13(21.3)	2.30	1.20-4.43	0.011
No	191(61.6)	119(38.4)			
Heavy Backpack					
Yes	120(71.0)	49(29.0)	1.71	1.11-2.64	0.015
No	119(58.9)	83(41.1)			
Exercise					
Regularly	61(56.5)	47(43.5)	1.43	0.89-2.29	
Not Regularly	135(64.9)	73(35.1)	2.76	1.31-5.81	0.023
Not at All	43(78.2)	12(21.8)			
Coffee Consumption					
≥ 3 cups/week	43(70.5)	18(29.5)	1.53	0.82-2.82	
≤ 3 cups/week	66(68.0)	31(32.0)	1.36	0.82-2.26	0.272
Not at All	130(61.0)	83(39.0)			
Mean± SD					
	Mean±SD (Yes)	Mean±SD (No)			
Hours of Screen time	6.37±2.89	5.60±2.93			0.017
Hours of Study	4.84±2.58	5.12±2.46			0.308
Hours of Sleep	8.54±1.58	9.05±1.96			0.008
Body Mass Index	21.62±3.74	22.05±7.50			0.465

study specifically neck, shoulder, and back pain are the most frequently reported sites of musculoskeletal pain in college students.[13]

Our study results are also no exception. In fact, more than half of our study population (64.4%) reported musculoskeletal pain in at least one body site in the past year. Comparable prevalence can be seen in studies such as those conducted by Alshagga *et al.* among the medical students of a Malaysian medical college and by Haroon *et al.* who investigated musculoskeletal pain prevalence and risk factors in medical students of Karachi, Pakistan. The authors found that 65.1% and 74.4% of students reported musculoskeletal pain in at least one site during the last year respectively.[9,14] Interestingly, prevalence rates in the students of a Saudi Arabian medical school were found to be as high as 85.3% at any one time and 81.9% during the past year even surpassing the musculoskeletal pain prevalence of nurses, doctors, dentists and other health care professionals. Clinical practice was associated with high prevalence of musculoskeletal pain in our study. This data was similar to a study conducted on health students in south of Brazil. This can be attributed to the rigorous training received, in which students spend long hours standing in the same position when observing operations or at ward bedsides. Hours spent seated on uncomfortable and inadequate furniture, carrying heavy reading material also takes its toll. Moreover, the study conducted on students of University of South Brazil similarly showed association between use of backpacks above 3.2kg and musculoskeletal pain. Students usually carry their bags in such a way that it causes undue stress on their joints, bones and muscles.

To add to the problem, computers and mobile phones have now become an essential supplement to academics as a ready and often preferred source of information on top of a common means of entertainment. Continuously increasing amounts of time are now being spent on screens by students. When using these devices, such stances and positions are adopted placing strain on various structures that can cause pain and musculoskeletal changes, especially in the arms and vertebral column.[15] Alarmingly a certain study reported a very high prevalence (60.3%) of smartphone addiction among medical students. Pain related to smartphone addiction was most common in the neck (60.8%), followed by lower back (46.8%) and shoulder (40.0%). Our study also showed that students who reported musculoskeletal pain had a significantly higher screen time than those who didn't.[16]

In this current study students who were classified as obese with a higher BMI showed no significance towards development of musculoskeletal pain which was in marked contrast to several recent studies that link raised body mass index (BMI) to musculoskeletal pain because of the presence of a chronic systemic inflammatory state.[17] Excess weight has also been related to musculoskeletal pain as it contributes to the development of bone deformities and dysfunctions.[18] Moreover, daily consumption of coffee by students showed no association with musculoskeletal pain in our study but in another study overviewing risks of coffee consumption it was seen that there were severe effects on bones. Poor bone quality was seen in individuals with increased daily coffee intake.[19]

Sleeping habits of students were also analyzed and it showed that lesser sleeping hours in students was related to high prevalence of musculoskeletal pain in the last one year but showed no effect in the last 7 days. The difference in results can be because of the gradual effect of lifestyle change on an individual's health. In a similar study on nursing students from Ethiopia, sleeping hours had a significant role in neck pain.[12]

LIMITATIONS OF STUDY

Although this study proved a high frequency of musculoskeletal pain among the medical students of Rawalpindi, however an in-depth review of the risk factors associated with ergonomics was lacking.[20] Furthermore, response bias in reporting factors such as height and weight could be present tampering with the accuracy of the results. The effect of psychological factors such as stress and anxiety as well as smoking was not assessed.[14,21] Musculoskeletal pain association with diet was also not found.[22] All these factors limit the generalizability of results.

CONCLUSION

The prevalence of musculoskeletal pain proved to be significantly high among medical students of Rawalpindi. Several contributing factors have been identified related to both lifestyles of students and the demands of medical school.

RECOMMENDATIONS

Awareness about the high prevalence of musculoskeletal pain in medical students should be carried out. Immediate solutions that are designed to improve comfort in the work environment and reduce any physical stress like better posture need to be proposed. Medical schools should take appropriate measures to reduce musculoskeletal pain frequency among students.

Conflict of Interest: None.

Author's Contribution

Following authors have made substantial contributions to the manuscript as under:

AH: Supervision, Conception, Study design, analysis and Interperitation of data, Critically reviewed manuscript & approval for the final version to be published.

SFM: Co-supervision, Data entry, analysis and interpretation, manuscript writing & approval for the final version to be published.

AKFR:, MAH: Critically reviewed, Drafted manuscript & approval for the final version to be published.

RS:, TN: Data colllection, Entry and analysis of data, preparation of rough draft & approval for the final version to be published.

MU: Data collection and entry & approval for the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

REFERENCES

1. Hasan MM, Yaqoob U, Ali SS, Siddiqui AA. Frequency of musculoskeletal pain and associated factors among undergraduate students. Clin Med Case Rep 2018;7(2):131-145. Doi: 10.4236/crcm.2018.72011
2. Cieza A, Causey K, Kamenov K, Hanson SW, Chatterji S, Vos T, et al. 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. The Lancet 2020; 396(10267): 2006-2017. doi: 1016/S0140-6736(20)32340-0
3. Centre fo Disease Control. Work-Related Musculoskeletal Disorders & Ergonomics. [cited on: August, 2021] [Internet] availableat:https://www.cdc.gov/workplacehealthpromotio/health - strategies/musculoskeletal-disorders/index.html]
4. Dighriri YH, Akkur MA, Alharbi SA, Madkhali NA, Matabi KI, Mahfouz MS, et al. Prevalence and associated factors of neck, shoulder, and low-back pains among medical students at Jazan University, Saudi Arabia: A cross-sectional study. J Family Med Prim Care 2019; 8(12): 3826-3831.
5. Algarni AD, Al-Saran Y, Al-Moawi A, Bin Dous A, Al-Ahaideb A, Kachanathu SJ, et al. The prevalence of and factors associated with neck, shoulder, and low-back pains among medical students at university hospitals in Central Saudi Arabia. Pain Res Treat 2017; 2017(2): 1235706. doi: 10.1155/2017/1235706
6. Vujcic I, Stojilovic N, Dubljanin E, Ladjevic N, Ladjevic I, Sipetic-Grujicic S, et al. Low back pain among medical students in Belgrade (Serbia): a cross-sectional study. Pain Res & Manag 2018; 2018(1): 8317906. doi 10.1155/2018/8317906
7. Du JY, Aichmair A, Schroeder JE, Kiely PD, Nguyen JT, Lebl DR, et al. Neck Pain and Low Back Pain in Medical Students: A Cross-Sectional Study. Int Arch of Public Health Community Med 2017; 1(1): 1-9. doi: 10.23937/iaphcm-2017/1710002
8. Alturkistani LH, Hendi OM, Bajaber AS, Alhamoud MA, Althobaiti SS, Alharthi TA et al. Prevalence of lower back pain and its relation to stress among medical students in Taif University, Saudi Arabia. Int J of Prev Med 2020; 11(35): 52-60. doi: 10.4103/ijpvm.IJPVM_264_19
9. Alshagga MA, Nimer AR, Yan LP, Ibrahim IA, Al-Ghamdi SS, Al-Dubai SA, et al. Prevalence and factors associated with neck, shoulder and low back pains among medical students in a Malaysian Medical College. BMC Res Notes 2013; 6(1): 1-7. doi: 10.1186/1756-0500-6-244
10. Ogunlana MO, Govender P, Oyewole OO. Prevalence and patterns of musculoskeletal pain among undergraduate students of occupational therapy and physiotherapy in a South African university. Hong Kong Physiother J 2021; 41(01): 35-43.
11. Nasir W, Hassan A, Amjad F. Prevalence of Upper Extremity Musculoskeletal Disorders in Health Professionals in Lahore. Pak J of Physical Therapy 2020; 1(1): 10-13.
12. Yirdaw G, Lamore Y, Lette A, Daba S. Back and upper body musculoskeletal pain and associated factors among medicine and nursing practicing students at university of Gondar, Ethiopia. Afr J Med Health Sci 2021; 20(7): 88-97.
13. Hanvold TN, Veiersted KB, Waersted M. A prospective study 610 of neck, shoulder, and upper back pain among technical 611 school students entering working life. J Adolesc Health J 2010; 46(5): 488-494. doi: 10.1016/j.jadohealth.2009.11.200
14. Haroon H, Mehmood S, Imtiaz F, Ali SA, Sarfraz M. Musculoskeletal pain and its associated risk factors among medical students of a public sector University in Karachi, Pakistan. JPMA. The J Pak Med Assoc 2018; 68(4): 682-688.
15. Morais BX, Dalmolin GL, Andolhe R, Dullius AIS, Rocha LP. Musculoskeletal pain in undergraduate health students: prevalence and associated factors. Rev Esc Enferm USP 2019; 53(1): e03444. doi: 10.1590/S1980-220X2018014403444
16. Alsalameh AM, Harisi MJ, Alduayji MA, Almutham AA, Mahmood FM. Evaluating the relationship between smartphone addiction/overuse and musculoskeletal pain among medical students at Qassim University. J Family Med Prim Care 2019; 8(9): 2953-2959. doi: 10.4103/jfmpc.jfmpc_665_19
17. Seaman DR. Body mass index and musculoskeletal pain: is there a connection? Chiropr Man 2013; 21(1): 1-9.
18. Bihari V, Kesavachandran C, Pangtey BS, Srivastava AK, Mathur N. Musculoskeletal pain and its associated risk factors in residents of National Capital Region. Indian J Occup Environ Med 2011; 15(2): 59-63. doi:10.4103/0019-5278.90375
19. Kirsty P, Luciano N, Marino P. A comprehensive overview of the risks and benefits of coffee consumption. Compr Rev Food Sci Food Saf 2016; 15(4): 671-684. doi: 10.1111/1541-4337.12206
20. Sweeney K, Mackey M, Spurway J, Clarke J, Ginn K. The effectiveness of ergonomics interventions in reducing upper limb work-related musculoskeletal pain and dysfunction in sonographers, surgeons and dentists: a systematic review. Ergonomics 2021; 64(1): 1-38. doi: 10.1080/00140139.2020.1811401
21. Micheletti JK, Bláfoss R, Sundstrup E, Bay H, Pastre CM, Andersen LL, et al. Association between lifestyle and musculoskeletal pain: cross-sectional study among 10,000 adults from the general working population. BMC Musculoskelet. Disord 2019; 20(1): 1-8. doi: 10.1186/s12891-019- 3002-5
22. Elma Ö, Yilmaz ST, Deliens T, Coppieters I, Clarys P, Nijs J et al. Do nutritional factors interact with chronic musculoskeletal pain? A systematic review. J Clin Med 2020; 9(3): 702.

....