

## Original Article

## Prevalence of Musculoskeletal disorders among the Surgical and Anesthesia Technologists in Selected Hospitals of Isfahan in 2018

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### Abstract

**Background & Objective:** screening for the prevalence of skeletal disorders is needed for the early prevention and intervention of the disorders. For this purpose, the present study aimed to determine the prevalence of musculoskeletal disorders among surgical technologists and anesthesiologists.

**Materials & Methods:** In this analytical - descriptive cross-sectional study, 167 personnel working in the operating room of Isfahan, Iran in 2018, were evaluated using the random sampling technique. The data from the general Nordic and Cornell questionnaires were analyzed using SPSS, version 20, software as well as the statistical tests including T-test, Chi-square, Mann-Whitney U and logistic regression.

**Results:** Women constituted 82% of our population. The mean age and work experience of the subjects were  $32.68 \pm 8.64$  and  $10.1 \pm 8.3$  years, respectively. The prevalence of musculoskeletal disorders among the surgical technologists and anesthesiologists was 96.74 and 90.9, respectively.

**Conclusion:** Given that the occupational health status of surgical technologists and anesthesiologists was not at a desirable level, this could compromise the health and work quality of the surgical team; therefore, it seems that the inclusion of some measures such as exercise, modified ergonomics` equipment, and striving to improve one's social and psychological well-being could be efficient and beneficial to prevent these disorders.

**Keywords:** Prevalence, Musculoskeletal, disorders, surgical technologists, Anesthesia Technologists

### Introduction

Musculoskeletal disorders are one of the most common work-related injuries in developed and especially developing countries (1–3). Work-related mortality accounted for 5% of the global total deaths, with 40% of the deaths occurring in developing countries than in developed countries (4). These preventable disorders can cause carpal

tunnel syndrome, tendonitis, degenerative spine disorder, thoracic outlet syndrome, cervical spondylosis (5), tired eye, and thenar neuropathy by affecting the muscle, tendon and nerve areas (6). Approximately 4% of the world's gross domestic product is lost with the cost of injury, death and disease through absence from work, sickness treatment, disability and survivor benefits (7). According to the statistics, these costs account for more than 1.13% of the total public expenditure in Iran (8,9). The working place (10) and individual activities play an important role in the prevalence of these disorders (11). Due to the different work

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environments and mechanisms from other workplaces, the operating room could harm the health of surgical personnel (12). These people suffer from the dynamic and high forces resulting from pushing, pulling and lifting heavy equipment and surgical equipment, and static forces caused by prolonged standing posture, awkward posture during the surgery and working for long periods in a standing position and performing highly repetitive and monotonous tasks for a long time (7,13,14). Surgical technologists and anesthesiologists are key members of the surgical team. They operate from the time between the entry and exit of the patient from the operating room and participate in all surgical procedures. In addition to their specialized duties, such as providing the equipment, sets and pegs, meeting the needs of surgical team related to the sterile surgery, preparing the sterile surgical environment, assisting the surgeon during the surgical process by technologists (15), providing the necessary equipment, helping the anesthesia personnel to perform the analgesia procedure and caring for the patient's vital signs during the surgical procedure and safe transfer to the recovery stretcher, the surgical technologists and anesthesiologists are also responsible for the patients' safety and care. Therefore, these problems may influence the efficiency and effectiveness of the surgical team and challenge the patients' health and safety. Considering the destructive effects and significant prevalence of musculoskeletal disorders, it seems necessary to conduct more researches in this field and especially on the operating room nurses to determine the related factors to the occurrence of musculoskeletal disorders and provide strategies for decreasing them.(16) Considering the above-mentioned descriptions and lack of knowledge regarding the occupational health status of these people, especially anesthesiologists, the present study aimed to determine and compare the prevalence of musculoskeletal disorders and the pain severity of surgical technologists and anesthesiologists working in operating rooms of Isfahan, Iran.

## **Materials & Methods**

This analytical - descriptive cross-sectional study was performed after obtaining the ethical code from Isfahan University of Medical Sciences and getting

permission from hospital authorities, as well as written consent from the subjects. The study population consisted of 200 surgical technologists and anesthesiologists working in 7 selected hospitals and clinics in Isfahan; the subjects were selected using the random sampling technique. The subjects entered the study after meeting the inclusion and exclusion criteria for eligibility. The inclusion criteria were: voluntary and satisfactory participation in research, having at least one year of relevant job experience and having a surgical technician or anesthesiologist degree; exclusion criteria included: incomplete questionnaire and being a student. Finally, 136 subjects were included in the study (123 surgical technologists and 44 anesthesiologists). The subjects were then assessed using the general Nordic and Cornell questionnaires. The general Nordic questionnaire is one of the most comprehensive diagnostic instruments for skeletal disorders with a reliability value of 87%. The questionnaire consisted of two sections; the first section included the following items: demographic information regarding age, height, weight, marital status, regular exercise, ergonomic awareness, job satisfaction, occupational stress, satisfaction with the monthly plan for the operating room, operating room attendant and visual requirement. The second section was used to determine the prevalence of skeletal disorders in nine areas of the body over the past year. The Cornell questionnaire was also used to determine the frequency and severity of pain in the past week. Finally, the collected data were analyzed using SPSS, version 20, software and statistical tests including T-test, Chi-square, Mann-Whitney U and logistic regression.

## **Results**

### **Sample characteristics**

According to table 1 women constituted 82% of the current study's population. The majority of studied subjects were married (63.6%, 59.1%) and right-handed (95.5%, 86.6%), with the mean age ( $32.57 \pm 8.23$ ,  $33.0 \pm 9.8$ ), height ( $165.52 \pm 7.39$  and  $164.23 \pm 6.31$ ), weight ( $63.89 \pm 10.15$  and  $63.57 \pm 11.09$ ) and work experience ( $10.75 \pm 9.12$ ,  $9.83 \pm 8.00$ ). Also, most subjects had some

degree of ergonomic awareness (52.3%, 54.3%). Their job satisfaction level (61.4%, 59.1%), responsibility for the operating room (40.9%, 50.4%) and working plan (56.8%, 60.6%) were not high. This study's population had low occupational stress (52.3%, 50.4%) and visual requirement (47.7%, 51.2%); these people had

demographic characteristics. According to the results of logistic regression, there was a significant relationship between the back pain with exercise and the number of patients in surgical technologists ( $P= 0.25$ ,  $P = 0.17$ ). However, no significant relationships were found between the demographic and other

**Table 1.** Comparing the demographic characteristics in surgical technologists and anesthesiologists

Variable	Surgical technologists	Anesthesiologists	P- value	Value	Z
Age	32.57	33	0.760	-.306	
Weight	63.89	63.57	0.626	+ 2261.000	-.488
Height	165.52	164.23	0.221	+1980.500	-1.225
Work experience	9.83	10.75	0.879	+2365.500	-.152
Overtime	45.68	39.36	0.738	+2302.000	-.335
Operation time	107.83	117.38	0.915	+2103.000	-.106
Resting period	7.39	53.4	0.096	+1802.000	-1.665

Whitney U-Mann test to compare the two groups.  
Test -t test to compare the two groups.

**Table 2.** Comparing the demographic characteristics in surgical technologists and anesthesiologists

Organs	Surgical Technologists		Anesthesiologists		P- value	x <sup>2</sup>
	Number	Percent	Number	Percent		
Neck	73	57.5	23	52.3	0.384	0.759
Shoulder	73	57.5	25	56.8	0.008	7.047
Elbow	21	16.5	7	15.9	0.843	0.039
Wrist	52	40.9	16	36.3	0.469	0.524
Back	37	29.1	20	45.5	0.001	11.035
Waist	84	66.1	31	70.5	0.691	0.158
Hip and thigh	23	18.1	12	27.3	0.240	1.378
Knee	75	59	23	52.3	0.287	1.132
Leg and ankle	56	44.1	22	50	0.641	0.218

Chi-Square test to compare frequencies between the two groups

no plans to exercise (77.3%, 75.6%). 75 percent of our subjects worked in the teaching hospitals and 33.5 percent worked in the field of general surgery. During one shift, several patients ( $3.77 \pm 1.59$ ) underwent surgery. The intervals between the surgeries were very low ( $6.88 \pm 8.36$ ). The results of (Table 1) did not show any differences between the two groups in terms of

underlying factors ( $P>0.5$ ). There were also no significant correlations between the back pain and demographic and underlying factors in the anesthesia group ( $P>0.5$ ).

**Musculoskeletal disorders**

(Table 2) presents and compares the prevalence of musculoskeletal disorders in both groups. As shown in the table, the highest complaints of

surgical technologists over the last 12 months belonged to the disorders in the lumbar (66.1%, N= 84) and knee areas (59%, N= 75); the anesthesia personnel reported disorders in the shoulder (56.8%, N= 25) and lumbar (70.5%, N= 31) areas. Besides, the lowest reported prevalence in both groups was related to the elbow (15.9%, 16.5%) and thigh (27.3%, 18.1%) areas. Over the last 7 days, the majority of technologists and anesthesiologists have experienced knee problems (44.9%) and back pain (56.8%), respectively. Among the technologists, the most common reasons for failure to set daily routines were related to the complaints in the lumbar and knee areas (20.5%, 26%) and back pain (13%, 29.5%) in the anesthesia group. The severity of leg pain in technologists and back pain in the anesthetists was higher than in other areas. Moreover, both groups reported frequent leg pain during the day (22.7%, 17.3%). According to the same table, the prevalence of musculoskeletal disorders in the back and shoulder areas was significantly higher in the technologist group than in the anesthesia group.

## **Discussion**

The working environment in the operating room could compromise the musculoskeletal health due to the high prevalence of these disorders among the surgical technologists (96.74) and anesthesiologists (90.9). In line with the results of the current study, the prevalence of musculoskeletal disorders was reported high in different parts of the world including Iran, Switzerland and Greece (4, 15-20). Comparing the demographic characteristics in both groups did not show a significant difference, which may be due to the prevalence of similar disorders in both groups. Further, comparing the prevalence of musculoskeletal disorders showed that the shoulder and lumbar problems in the technologist group were significantly higher than the anesthesia group, suggesting the significance of controlling risk factors in these areas. This might be attributed to the high activity of the shoulder and lumbar muscles with awkward posture while pulling and holding the retractors to remove the rigid tissues of the patient's body during the surgery. According to the results, the highest prevalence of disorders in both groups belonged to the lumbar area (66.1%, 70.5%). This result supported the finding from the previous studies

that warned the risk of back pain in the operating room group (21-23). This finding was also consistent with the results of the study by Aljeesh and Nawajha, which reported the prevalence of back pain in operating room nurses (70.6%) (24). Likewise, Asghari et al. (17) and Pahnabi et al. (4) reached similar results (67.1%, 61.9%), respectively. In contrast, Kerri et al. reported a low prevalence (48.41%) in Saudi Arabia (25).

Although the majority of subjects reported moderate back pain twice a week (29.9%, 29.5%), it was reported as the most important factor in preventing people from doing their daily activities. This suggested the significance of controlling the risk factors for the lumbar spine in both groups. This may be due to the unwillingness of surgical technologists to exercise because numerous studies supported the key role of exercise in preventing these disorders (26-29). Also, it can be attributed to taking static postures for a longer time including lumbar bending and rotation movements during the surgery. This result corroborated the result of the study by Shahijani et al. aimed to assess the musculoskeletal risk factors of staff working in the Laparoscopic field, which reported the lumbar bending and rotation as the risk factors affecting the lumbar disorders (15). In anesthesiologists, these disorders might be due to the awkward postures during the intubation procedure in patients. Also, high occupational stress has been implicated, because over half of our subjects reported high (52.3%) or very high (38.6%) stress levels. Previous studies suggested stress as a risk factor for the lumbar pain (30-32). Among the technologists, the highest prevalence of musculoskeletal disorders was belonged to the knee (59%), neck and shoulder (57.5%) areas following the back pain (59%). Asghari et al. performed a study on 144 operating room staff in Iran. Their results supported our results, suggesting that the pain in the back (61.9%) and knee (60.5%) areas are among the most common musculoskeletal problems in these people. Further studies also confirmed these results (4). But present study results did not confirm the results of Bahrami that was showed the highest prevalence of musculoskeletal disorder in the elbows (33). Interestingly, the highest frequency of pain among the nurses in Brazil and Italy was related to the waist, neck, and knee areas (34). In the anesthesiologist group, shoulder pain and neck pain were the most common areas following the back pain. Consistent with our

results, Ando et al. performed a study on 457 Japanese nurses and found that waist (54.7%), shoulder (42.8%), and neck (31.3%) were among the most common areas of pain in operating room nurses. Similarly, the prevalence of back, neck and shoulder pains was higher than in other areas in Greece and New Zealand (20, 35). A high prevalence of back (52.7%) and neck (38.4%) problems were also reported in Switzerland (19). Neck problem might be linked to the visual issues, because about half of our subjects had high-level visual requirements. According to the results, the highest pain intensity was observed in the lower leg area in the technologists' group and was consistently observed several times a day, whereas the subjects of anesthesia group suffered from the high severity of back problems compared to the other areas once in a week. This might be attributed to the occupational nature of these individuals, as they have to travel and walk long distances as a circular and also have to endure prolonged and frequent standing throughout surgery as a scrub. Evidence suggested that long-term walking and standing are among the main stressors of the lower extremities (36). In the anesthesia group, the back problems are likely linked to the ergonomically inappropriate and unfavorable seating position and non-standard chairs, as they are mostly in the sitting posture during and after the surgery except for the anesthesia procedure.

### **Conclusions**

Due to insufficient information on the occupational health status of technologists especially anesthesiologists, this study was conducted in operating rooms of Isfahan, Iran. According to the findings, the prevalence of musculoskeletal disorders in both groups, particularly in the back area, was reported high. This suggested that working conditions in the operating room were a serious threat to the health of these people, especially in the lower extremities, such as the knee and leg. However, the prevalence of pain in the lower extremities, such as the knee and leg, was high among the technologists. Psychosocial and biomechanical factors seem to be more involved in the prevalence of these disorders than morphological factors in our population. Since inadequate occupational health in these individuals can compromise the health and quality of the surgical teamwork and subsequently the safety and patient's surgical outcomes, it seems that the

inclusion of some measures such as exercise, use of ergonomic chairs, and effort to improve the social and psychological well-being of individuals can help to prevent and solve these problems and increases job motivation (37- 38).

### **Limitations of the study**

This study conducted a limited sample size in Isfahan and that's a necessity the future studies will be conducted in large samples of Statistical Society, and also in this study, our participants were working and after the end of surgery they answered the questionnaires and they were tired of answering the questions.

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### **Conflict of Interests**

The authors have not any conflict of interest.

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## مقاله پژوهشی

## شیوع اختلالات اسکلتی-عضلانی در بین کارشناسان اتاق عمل و بیهوشی در بیمارستانهای منتخب اصفهان در سال ۱۳۹۷

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## چکیده

**زمینه و هدف:** غربالگری شیوع اختلالات اسکلتی برای پیشگیری و مداخله زودرس این اختلالات لازم است. به همین منظور، مطالعه حاضر با هدف تعیین شیوع اختلالات اسکلتی عضلانی در بین کارشناسان اتاق عمل و بیهوشی انجام شد.

**مواد و روش ها:** در این مطالعه توصیفی مقطعی - تحلیلی، ۱۶۷ پرسنل شاغل در اتاق عمل اصفهان در سال ۲۰۱۸ با استفاده از روش نمونه گیری تصادفی مورد بررسی قرار گرفتند. داده های حاصل از پرسشنامه های عمومی نوردیک و کرنل با استفاده از نرم افزار SPSS، نسخه ۲۰، نرم افزار و همچنین آزمون های آماری شامل آزمون T، Chi-Square، Mann-Whitney U و رگرسیون لجستیک مورد تجزیه و تحلیل قرار گرفت.

**نتایج:** زنان ۸۲ درصد از جمعیت ما را تشکیل می دادند. میانگین سنی و سابقه کار آزمودنی ها به ترتیب ۳۲/۸ ± ۸/۳ سال و ۳۲/۸ ± ۸/۳ سال بود. شیوع اختلالات اسکلتی عضلانی در بین تکنسین های جراحی و بیهوشی به ترتیب ۹۶/۷۴ و ۹۰/۹ بود.

**نتیجه گیری:** با توجه به اینکه وضعیت بهداشت حرفه ای متخصصان جراح و متخصص بیهوشی در حد مطلوبی نبوده است، می تواند سلامت و کیفیت کار گروه جراحی را به خطر اندازد. بنابراین، به نظر می رسد گنجانیدن برخی اقدامات مانند ورزش، تجهیزات ارگونومی اصلاح شده و تلاش برای بهزیستی اجتماعی و روانی فرد می تواند برای پیشگیری از این اختلالات موثر و سودمند باشد.

**کلمات کلیدی:** شیوع، اسکلتی عضلانی، اختلالات، کارشناسان اتاق عمل، کارشناسان بیهوشی

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