

**PREVALENCE, RISK FACTORS, AND OCCUPATIONAL IMPACT OF
MUSCULOSKELETAL DISORDERS AMONG ORTHOPEDIC TRAUMA SURGEONS: A
CROSS-SECTIONAL SURVEY STUDY****Dr. Ashok Reddy^{1*}, Dr. Danduru Vasudevava Reddy²**¹Associate Professor, Department of Orthopedics, Indira Medical College and Hospital Tiruvallur, Chennai²Assistant Professor, Department of Orthopedics, Indira Medical College and Hospital Tiruvallur, Chennai**Corresponding Author: Dr. Ashok Reddy****Abstract**

Surgeon injury and hazards have now become more of an issue primarily in orthopedic surgery. The reason as to why this research was done was to determine how prevalent orthopedic trauma surgeons are musculoskeletally injured and the type of injury they sustain, and whether the injury has any discernable effect on their career. A survey with a different degree of minor modification of the initial one (a physical discomfort survey) was sent to the members of the Orthopaedic Trauma Association (OTA), where 100 respondents were surgeons. The majority of the sampled were male (85%), and their right hand is the most frequently used (92%), and their greatest source of work was academic centers. The majority of the respondents (63%) stated that they were injured at work and the most prevalent was the low back pain. Surgeons above 45 years reported an increase in the cases of injury (75%), whereas the cases among younger surgeons were nearly 20% lesser (54.5%). Women operating were identified to get injured much more frequently than their male counterparts (84.6% vs. 61.6) and the same was the case with right-handed surgeons who depicted a high number of injuries compared with the left-handers. The highest rate of injury was experienced by community surgeons and surgeons who practiced in more than one facility (76.1 and 80 percent respectively). Surgeons who handled injuries were forced to miss work as much as 27 percent of their workweek, those over 65 and those working in more than one institution (academic and private practice) had the highest number of missed work weeks. The correlation between the frequency of injuries in patients and the number of surgeries performed by a physician per year was not strong. Surgeons with a period of use exceeding ten years tended to have more than one of their body parts injured. These are the fact that in many instances they are required to deal with challenging, demanding and risky cases. They state that the operating room should be fitted with better ergonomic measures like body supports, taking frequent stretching breaks, use of microscopes to ensure good body position and use of power assisted tools to reduce the body strain. In case the ergonomics of the working environment is enhanced, the number of surgeons who develop musculoskeletal disorders might decrease and this will probably be beneficial to the wellbeing of the surgeons, the potential of the working population and patient care.

Keywords: *Orthopedic Trauma Surgery, Occupational Hazards, Musculoskeletal Disorders, Surgeon Ergonomics*

1. INTRODUCTION

The topic of occupational injuries and hazards is becoming more and more popular among the surgical community in general, and orthopedic sources in particular. Different aspects of occupational hazards have been discussed such as radiations, chemical hazards, psychological stressors, and musculoskeletal injuries. The orthopedic surgical environment has been identified to be a major cause of most of these dangers. It is



worth noting that among the spine surgeons, there has been a great increase in the likelihood of developing thyroid cancer that was attributed to the exposure of radiations. Moreover, polymethylmethacrylate cement which has been used in orthopedics since the 1950s has shown to cause toxic effects on the skin, respiratory as well as the nervous system. Also, electrocautery smoke has been discovered to expose surgeons to even higher levels of smoke compared to second hand smoke that is caused by tobacco. Psychologically; sleep deprivation and work demands have been cited to have a negative impact on the emotional status of the physicians. Surprisingly, the work of orthopedic surgeons creates significant physical loads to the body, especially to the musculoskeletal system. Monotony of tools, long standing, and adapting to a long-term and unstable posture are predisposing factors that lead to further stress of bones and muscles. It has been shown that orthopedic surgeons record the highest levels of musculoskeletal complaints as opposed to most other medical professionals, with most of them being related to the neck, back, and upper limbs. Although ergonomic guidelines to optimize the conditions of the operating room have been available, the issues, such as the lack of awareness and practical issues in its implementation, have impeded their success. Trauma surgery is one of the orthopedic subspecialties that places a strong strain on musculoskeletal system. The prior studies examining the occurrence of musculoskeletal injuries and its effect on orthopedic surgeons have reported that the rate of injury among those specializing in trauma is higher than that of the rest, but since only a few studies have involved trauma surgeons, the subgroup analysis could not be done in detail. The actual research is aimed at an evaluation of the data gathered on musculoskeletal injury by the means of the surveys of orthopedic trauma surgeons and analyzes the effects of such injuries on their professional activities.

2. MATERIALS AND METHODS

The current research was carried out in the form of a cross-sectional survey study based on the questionnaire to estimate the rate of work-related musculoskeletal disorders (WRMSDs) among orthopedic trauma surgeons and the presence of any risk factors. The study has covered 100 orthopedic trauma surgeons by convenience sampling. A structured self-administered questionnaire was used to collect the data and included both demographic and professional variables. The questionnaire included data about the sex, age, hand dominance, the nature of practice setting (academic, community, private or other), the number of institutions one was affiliated with, the yearly surgical caseload, and years of clinical experience. Secondly, the participants were to provide the details of the presence of work-related musculoskeletal injuries, and whether these conditions had led to the absence of employment. The survey tool was developed in such a way that it was clear and relevant in terms of the questions and was electronically distributed to make it accessible to more people. The respondents were involved in the study on a voluntary basis and the confidentiality of the respondents was ensured. The data obtained was tabulated and grouped according to the research variables. The data were summarized using descriptive statistical analysis and the frequency and percentages were used to present the results. A comparative study was conducted among various subgroups, such as age, sex, hand dominance, type of practice, institutional affiliation, caseload per year, and years of practice, to find the trend and differences in the prevalence of injuries and work absent. The results were tabulated in order to make them more readable and easier to interpret. Such an approach to the issue allowed evaluating the incidence of WRMSDs in the group of orthopedic trauma surgeons in a comprehensive manner and offered some observations on the possible occupational risk factors that can lead to the development of these conditions

3. RESULTS

The orthopedic trauma surgeons who participated in the survey were a hundred. Most of the individuals who took part were men (85%), and they used their right hands far more frequently (92%). Approximately 2/3 of the respondents were in academic institutions and 25, 5 and 6% were categorized as community practices, private practice, and other respectively. In this regard, 63 surgeons responded in the affirmative that they have



had work-related injuries (63%). There were very varying rates of those disorders across various age groups. Among the surgeons aged 45 years and below, 54.5% had injuries and the figure was more than 75% among the surgeons aged above 45. Majority of the injuries occurred among the 46-55 years old (76.9%), 56-65 years old (75.0%) and above the 65 years of age (75.0%). Similarly, female surgeons were reported to be getting injured more frequently (84.6) compared to male surgeons (61.6). Right-handed surgeons declared more injuries (68.4%), compared to the left-handed ones (28.6%). The risk of injury depended on the receipt of care. The largest number of injuries occurred in community settings (76.1), then in a private clinic (75.0), and other settings (66.7) and in academic centers (60.0). It was also revealed that the rate of injuries is higher among the surgeons who perform work in more than one institution (80.0) than those who just work in one hospital (64.2). Out of all surgeons, 27% had to take a break due to musculoskeletal diseases, and the oldest surgeons aged above 65 required it the most (66.7%), and the final group of surgeons having more than one place of work (100%). In approximately quarter of those incidents (26.7 and 27.3, respectively), both female and male surgeons had ceased to work due to injury reasons. The highest percentage of surgeons who reported needing to miss work was 100% among those who practiced in other areas and those who trained in more than one institution (Penske, 2016). Caseload and injury rates did not have a definite correlation, but the highest number of injuries was declared by the surgeons who performed 301-400 cases annually (72%). The most frequent rate of injuries was with the 11 to 20 years of experience group (82.1% with increase in time in practice). Among all surgeons, surgeons with over 30 years of experience had to take a leave off work the most frequent (66.7%). Generally, it is evident that musculoskeletal injuries associated with work are prevalent among orthopedic trauma surgeons and there are various factors as to why the injuries take place and why some surgeons fail to be at work.

Table 1: Distribution of Sex and Hand Dominance among Orthopedic Trauma Surgeons

Characteristic	No. (%)
Sex	
Male	85 (85.0)
Female	15 (15.0)
Hand dominance	
Right	92 (92.0)
Left	8 (8.0)

Table 2: Number of surveyed trauma surgeons with disorders and their requirement of time off work according to sex, age, hand dominance, type of practice and number of institutions

Characteristic	Total No. of Respondents	Respondents with Injuries	Respondents with Injuries Who Needed Time Off Work
Age			
≤ 45	51	28 (54.5%)	5 (16.7%)
46–55	30	23 (76.9%)	6 (25.0%)
56–65	14	11 (75.0%)	5 (44.4%)
> 65	5	4 (75.0%)	3 (66.7%)
Sex			
Male	85	52 (61.6%)	14 (26.7%)
Female	15	13 (84.6%)	4 (27.3%)
Hand dominance			
Right	92	63 (68.4%)	17 (27.8%)
Left	8	2 (28.6%)	0
Type of practice			



Academic	64	38 (60.0%)	9 (24.2%)
Community	25	19 (76.1%)	3 (12.5%)
Private	5	4 (75.0%)	2 (33.3%)
Other	6	4 (66.7%)	4 (100.0%)
No. of institutions			
1	94	60 (64.2%)	13 (21.2%)
> 1	6	5 (80.0%)	5 (100.0%)

Table 3: Number of surveyed trauma surgeons with disorders and their requirement of time off work according to annual case load and number of years in practice

Characteristic	Total no. of respondents	Group; no	
		Respondents with injuries	Respondents with injuries who needed time off work
Annual caseload			
≤ 100	7	5	2
101–200	10	7	2
201–300	14	7	4
301–400	25	18	2
401–500	15	9	1
> 500	15	10	4
Years in practice			
≤ 10	35	18	3
11–20	28	23	5
21–30	18	12	5
> 30	5	3	2

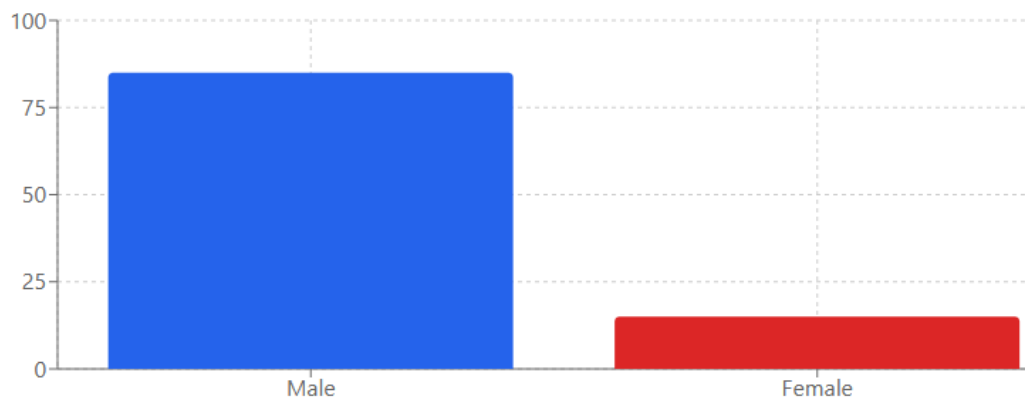


Figure 1: Distribution of Sex and Hand Dominance Among Orthopedic Trauma Surgeons

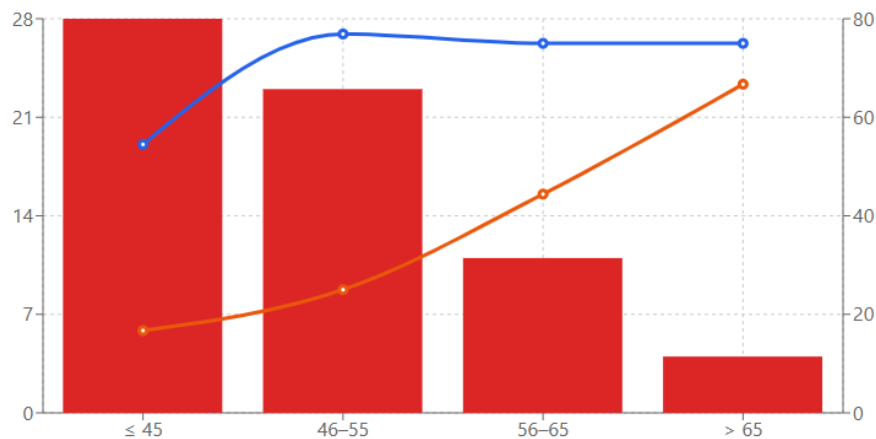


Figure 2: Trauma Surgeon Injuries and Time Off Work Analysis

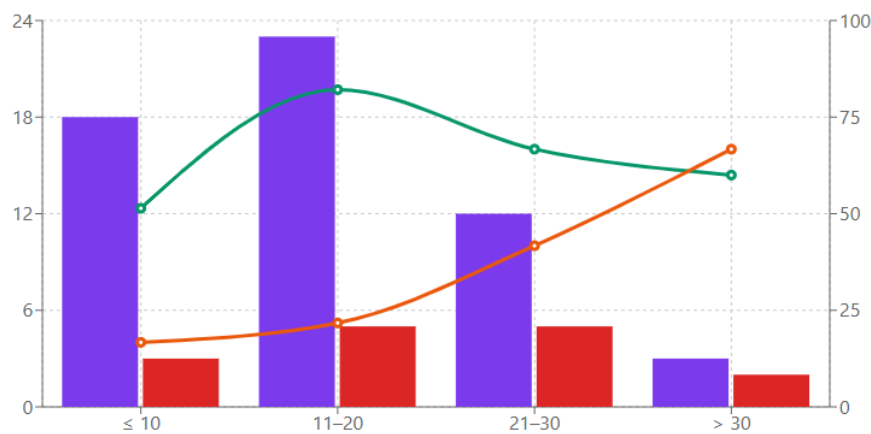


Figure 3: Trauma Surgeon Injuries by Annual Caseload and Years of Experience

4. DISCUSSION

Many studies have confirmed that surgeons and orthopedic surgeons in particular, are at greater risk for occupational injuries. Orthopedic surgeons had 44% of all injury cases and trauma subspecialists encountered more injuries than other surgeons, one investigation noted. In a similar way, our research noted that 65% of respondents had injuries. In past research, the anatomical regions often affected were the hand, lower back, neck and shoulder, though studies looking at spine surgeons showed most experienced low back and neck pain, with shoulder, elbow and wrist problems also occurring frequently. Of all our orthopedic trauma surgeons, most patients had back injuries, followed by wrist, elbow and foot injuries. A main explanation is that studies often find similar results, pointing to how surgeons must stand for many hours during lengthy surgeries which strains their neck and back. Frequently using surgical instruments can make upper limb tendinitis which commonly appears at the wrist and elbow, more likely. It has been reported that surgeons who use certain tools, one of them being the Kerrison rongeur, have a threefold chance of having carpal tunnel syndrome. Evidence from before 2018 indicated that a higher number of musculoskeletal injuries affected surgeons who had practiced for 20 to 30 years, yet a number of later studies have ruled out any such correlation. Study results suggested that year of practice did not directly affect injury reporting; instead, ten



or more years in practice tended to raise the number of affected body parts. In our study and others, neither age nor case volume of the surgeon was related to the likelihood of injury. It was noticed that the majority of surgeons who reported injuries were right-handed and surgeons employed in private practices frequently took time off because of these issues. The evidence shows that enhancing the ergonomic design of the operating room will support surgeons' health. Interventions to consider are body supports, more breaks for stretching, preferring to use microscopes instead of holding the neck while using loops and use of powered devices for screw insertion. More research is needed to create and review ways to improve the surgical setting and stop occupational injuries.

5. CONCLUSION

The study points out that most orthopedic trauma surgeons (65%) experience injuries related to their job, mainly due to musculoskeletal disorders. This matches what studies have shown before—that surgeons, especially those practicing orthopedics, tend to deal with increased chances of such injuries. The reason surgeons commonly experience problems in the lower back, wrist, elbow and foot is because of the physical stress from standing and repeating moves for long periods in surgery. Many surgeons have neck and lower back injuries due to the fact they have to stand in one place for a long time and often work in unnatural positions. Using surgical tools regularly also increases the chance of experiencing tendinitis in the elbow and wrist and it can also cause carpal tunnel syndrome. More cases of these problems among surgeons who use Kerrison rongeurs prove that certain equipment is a risk factor in occupational health. Remarkably, the finding suggests that years of practicing surgery does not directly impact the overall report of injuries, but surgeons with more than ten years usually report issues in several body parts. Thus, over a period of time, extended exposure to different types of physical stress can cause more widespread problems with the muscles and joints. Besides, surgeons' age and the number of cases they complete were not strongly correlated with how often injuries occur, meaning that the risk appears at all career stages and job loads. There were more reported injuries among right-handed surgeons which could be linked to their most used hand and how surgical tools and settings are arranged. In addition, surgeons working in private settings were more inclined to take a leave of absence because of their wounds which may indicate that the workplace environment for them is different or their workload is greater. The findings underline how important it is to update the ergonomics in operating rooms to reduce these occupational dangers. Body supports may help and surgeons should also make sure to stretch often, use microscopes instead of dissecting loops and use machines that lower the need for hand-operated drilling. Employing these strategies may lower the chances and severity of musculoskeletal disorders that surgeons experience. In short, enhancing ergonomics for surgeons benefits individuals, helps sustain the number of surgeons and improves patient care. Future studies should work on finding, using and assessing ergonomics that fit the demands of orthopedic trauma surgery



REFERENCES

- Lester JD, Hsu S, Ahmad CS. (2012). Occupational hazards facing orthopedic surgeons. *Am J Orthop*.41, 132–9.
- Wagner TA, Lai SM, Asher MA. (2006). SRS surgeon members' risk for thyroid cancer: Is it increased?. 41st *Annual Meeting of the Scoliosis Research Society*;
- Leggat PA, Smith DR, Kedjarune U. (2009). Surgical applications of methyl methacrylate: a review of toxicity. *Arch Environ Occup Health*.64, 207–12.
- Jofe MH. (2007). Surgically generated smoke exposure to surgeons during scoliosis surgery. 42nd Annual Meeting of the Scoliosis Research Society;
- Sargent MC, Sotile W, Sotile MO, (2009). Quality of life during orthopaedic training and academic practice. Part 1: orthopaedic surgery residents and faculty. *J Bone Joint Surg Am*.91, 2395–405.
- Small GW. House officer stress syndrome. *Psychosomatics*. 1981, 22, 860–9.
- Mirbod SM, Yoshida H, Miyamoto K, (1995). Subjective complaints in orthopedists and general surgeons. *Int Arch Occup Environ Health*.67, 179–86.
- Park A, Lee G, Seagull FJ, (2010). Patients benefit while surgeons suffer: an impending epidemic. *J Am Coll Surg*.210, 306–13.
- Van Veelen MA, Kazemier G, Koopman J, (2002) . Assessment of the ergonomically optimal operating surface height for laparoscopic surgery. *J Laparoendosc Adv Surg Tech A*.12, 47–52.
- Esser AC, Koshy JG, Randle HW. (2007). Ergonomics in office-based surgery: a survey-guided observational study. *Dermatol Surg*.33, 1304–13.
- Davis WT, Sathiyakumar V, Jahangir AA, (2013). Occupational injury among orthopaedic surgeons. *J Bone Joint Surg Am*.95, e107.
- Auerbach JD, Weidner ZD, Milby AH, (2011). Musculoskeletal disorders among spine surgeons: results of a survey of the Scoliosis Research Society membership. *Spine*. 36, E1715–21.
- Soueid A, Oudit D, Thiagarajah S, (2010). The pain of surgery: pain experienced by surgeons while operating. *Int J Surg*.8, 18–20.
- Forst L, Friedman L, Shapiro D. (2006). Carpal tunnel syndrome in spine surgeons: a pilot study. *Arch Environ Occup Health*.61, 259–62.
- Alqahtani SM, Alzahrani MM, Tanzer M. (2016). Adult reconstructive surgery — a high risk profession for work-related injuries. *J Arth*.
- Albayrak A, van Veelen MA, Prins JF, (2007). A newly designed ergonomic body support for surgeons. *Surg Endosc*.21, 1835–40.