

WORK RELATED MUSCULOSKELETAL SYMPTOMS AND THEIR ERGONOMIC RISK FACTORS AMONG SURGEONS OF PESHAWAR

Original Research

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ABSTRACT

Background: Musculoskeletal disorders (MSDs) are prominent causes of occupational injuries globally, affecting numerous professionals, particularly surgeons. These disorders, often resulting from prolonged static postures, repetitive movements, and the utilization of surgical instruments, lead to significant pain and disability.

Objective: To assess the prevalence and ergonomic risk factors of work-related musculoskeletal symptoms among surgeons in Peshawar.

Methods: This observational study spanned six months, with data collection over a two-month period using the Quick Exposure Check and Musculoskeletal Health Questionnaire. A total of 180 surgeons were selected through convenience sampling to participate.

Results: Among the participants, 135 were male and 45 female, predominantly aged between 30 to 35 years. The study identified a mild to moderate correlation between musculoskeletal pain and head and neck activities, which were more significant compared to the slight associations observed with shoulder and back activities.

Conclusion: The study highlights a mild prevalence of musculoskeletal pain predominantly caused by head and neck activities among surgeons, overshadowing the lesser impact of shoulder and back movements. These findings suggest the need for focused ergonomic interventions to mitigate the primary risks identified.

Keywords: Ergonomics; Musculoskeletal pain; Occupational health; Postural ergonomics; Surgeons; Surgical instruments; Work-related musculoskeletal disorders.

INTRODUCTION

Surgeons are frequently exposed to a range of occupational hazards, among which musculoskeletal disorders (MSDs) are particularly prevalent. These disorders encompass a spectrum of conditions affecting muscles, nerves, tendons, joints, cartilage, and spinal discs, as defined by the US Centers for Disease Control and Prevention(5). The origins of ergonomic science, derived from the Greek words for labor ('ergon') and natural laws ('nomia'), lie in optimizing the interaction between workers and their environments to enhance both human well-being and overall system performance(6, 7). Despite advancements in ergonomic designs, a significant proportion of surgeons still suffer from work-related musculoskeletal symptoms (WMS) that arise from the physically demanding nature of their roles.

The prevalence of WMSDs among surgeons is alarmingly high, ranging from 20% to 70%, with the neck, shoulders, and lower back most frequently affected(8). During various surgical procedures, such as open surgery, traditional laparoscopy, vaginal surgery, and robotic-assisted laparoscopic surgery, surgeons are required to maintain extended static postures, which contributes to the development of MSDs. The reported incidence of musculoskeletal issues spans from 66% to 94% during open surgery and up to 100% during traditional laparoscopy(9). These extended static postures often involve an extended forward cervical spine, twisted torso, and unsupported abducted arms, placing surgeons at risk for developing conditions like rotator cuff disease, varicose veins, carpal tunnel syndrome, and lumbar/cervical radiculopathy(8).

Musculoskeletal discomfort in surgeons not only results from the physical strain of surgery but is also exacerbated by the need to engage in repetitive and precise movements. High levels of mental focus are required, adding to the complexity of the surgeons' role, which also includes duties such as ward rounds, patient consultations, and administrative tasks(14, 18). Moreover, a study conducted on members of the American College of Surgeons revealed that 90% of respondents experienced musculoskeletal symptoms, with neck, lower back, shoulder, and upper back pain being the most commonly reported issues(10). The impact of gender on the prevalence of these disorders is also notable, with women reporting a higher likelihood of pain or discomfort related to their surgical practice(12).

The ergonomic risks associated with surgical practice are further complicated by the necessity to use various surgical instruments, which can require awkward grips or repetitive motions. These factors, coupled with the need for sustained focus and precision, make surgeons particularly susceptible to developing musculoskeletal symptoms that can severely impact their ability to perform their duties effectively. It is crucial to address the ergonomic challenges faced by surgeons to reduce the incidence of WMSDs. This requires a multidisciplinary approach that includes the application of ergonomic principles to surgical practices, equipment design, and workplace layouts to adapt the work environment to the physical needs of the surgeon rather than forcing the surgeon to adapt to the environment. Understanding and mitigating these risks not only improves the health and productivity of surgeons but also enhances the overall quality of care provided to patients.

METHODS

The methodology of the study involved a cross-sectional design, which was conducted over a six-month period from September 2022 to February 2023 in Peshawar. The participants consisted of 335 practicing surgeons, from whom a sample of 180 was derived using a non-probability convenience sampling method. The sample size was calculated with the Raosoft online calculator, adhering to a 95% confidence level and a 5% margin of error(24). This method was chosen due to its efficiency in selecting participants based on their availability and willingness to partake in the research, thereby facilitating timely data collection within the logistical constraints of the study. Participants included male and female surgeons from a variety of specialties such as general surgery, orthopaedics, urology, ENT, gynecology, neurosurgery, ophthalmology, and pediatric surgery. The age range of the participants was between 30 to 60 years(8, 25). The study encompassed surgeons at different career stages, including Trainee Registrars, Experiential Registrars, Assistant Professors, Associate Professors, and Professors. Exclusion criteria were strictly adhered to, excluding individuals with conditions such as inflammatory illnesses, non-degenerative arthropathies, malignancies, and those with a recent history of trauma or falls within the past six months(13, 14). Additionally, female surgeons experiencing gynecological conditions, those in the postpartum phase, or those who had undergone spinal anaesthesia, which could influence musculoskeletal pain, were also excluded from the study(5, 26).

The data collection process commenced after obtaining necessary approvals from the research committee and heads of departments. Informed consent was secured from all participants meeting the inclusion criteria. The primary tools used for data collection were the Quick Exposure Check (QEC) and Musculoskeletal Health questionnaires, which are validated instruments for assessing ergonomic risk factors and musculoskeletal health respectively. Data analysis was performed using SPSS version 22, where descriptive statistics such as frequencies, percentages, means, and standard deviations were calculated for both categorical and continuous variables, including age and Body Mass Index (BMI). Further statistical analysis involved Chi-square tests for categorical data and independent sample t-tests for assessing gender-based differences in ergonomic risk factors, with a significance level set at a p-value of less than 0.05. The coherent application of these methodological procedures ensured that the study was conducted rigorously and yielded reliable data, contributing valuable insights into the ergonomic risk factors affecting surgeons in various specialties.

RESULTS

The study encompassed a total of 180 surgeons to assess the prevalence of work-related musculoskeletal symptoms and their ergonomic risk factors in Peshawar. The demographic breakdown revealed a predominant age group of 30 to 35 years, accounting for 48.3% of participants, suggesting a higher incidence of musculoskeletal pain among younger surgeons possibly due to inexperience and poor posture during surgical procedures. The distribution across other age groups was 18.9% for ages 36 to 40 years, 24.4% for ages 41 to 45 years, 6.7% for ages 46 to 50 years, and 1.7% for ages 51 to 60 years. The gender distribution was notably skewed, with 135 males and 45 females participating in the study.

Table 1: Different age group categories of participant (male & female)

Age Groups		Gender		Total	Percent
		Male	Female		
AGE	30 to35 years	62	25	87	48.3
	36 to 40 years	23	11	34	18.9
	41 to 45 years	36	8	44	24.4
	46 to 50 years	11	1	12	6.7
	51 to 60 years	3	0	3	1.7
Total		135	45	180	100

In terms of the overall impact of musculoskeletal pain, different levels of discomfort were reported across age groups. The majority of participants in the 30 to 35 year age group reported varying degrees of pain, from extreme to none, with significant numbers experiencing at least some discomfort during the day. The occurrence of pain and stiffness was not evenly distributed, with notable declines in reported pain as age increased.

Table 2: Overall impact of musculoskeletal pain in different age group

AGE	Overall impact					Total
	Extremely	Very much	Moderately	Slightly	Not at all	
30 to35 years	2	8	15	22	40	87
36 to 40 years	0	2	1	10	21	34

AGE	Overall impact					Total
	Extremely	Very much	Moderately	Slightly	Not at all	
41 to 45 years	0	1	8	9	26	44
46 to 50 years	1	1	1	4	5	12
51 to 60 years	0	0	0	3	0	3
Total	3	12	25	48	92	180

The ergonomic impact assessment of musculoskeletal pain related to specific movements indicated significant findings. For shoulder and arm performance, participants reported pain based on the height at which tasks were performed: waist height, chest height, and above shoulder height. The analysis indicated a weak association between the ergonomic risk factors and musculoskeletal symptoms, although head and neck movements showed some significant correlation with reported pain, contrasting with the lesser significance for back movements.

Table 3: Pearson value for musculoskeletal pain and with shoulder performance

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17.730a	12	.124
Likelihood Ratio	10.312	12	.589
Linear-by-Linear Association	.029	1	.865

Additionally, the results underscored the varied impact of musculoskeletal pain due to back movements. Participants reported levels of pain from extreme to none, with the most frequent assessments indicating slight to moderate pain. This pattern also held for head and neck movements, suggesting a consistent trend across different types of physical stress encountered in surgical settings.

Table 4: Co-relation of overall musculoskeletal pain with back performance.

Overall impact	Observers_Assessment_BACK				Total
	Almost neutral	Moderately flexed or twisted or bent	Excessively flexed or twisted or bent	Frequently	
Extremely	0	2	1	0	3
Very much	1	7	4	0	12
Moderately	4	15	6	0	25
Slightly	16	22	10	0	48
Not at all	27	45	19	1	92
Total	48	91	40	1	180

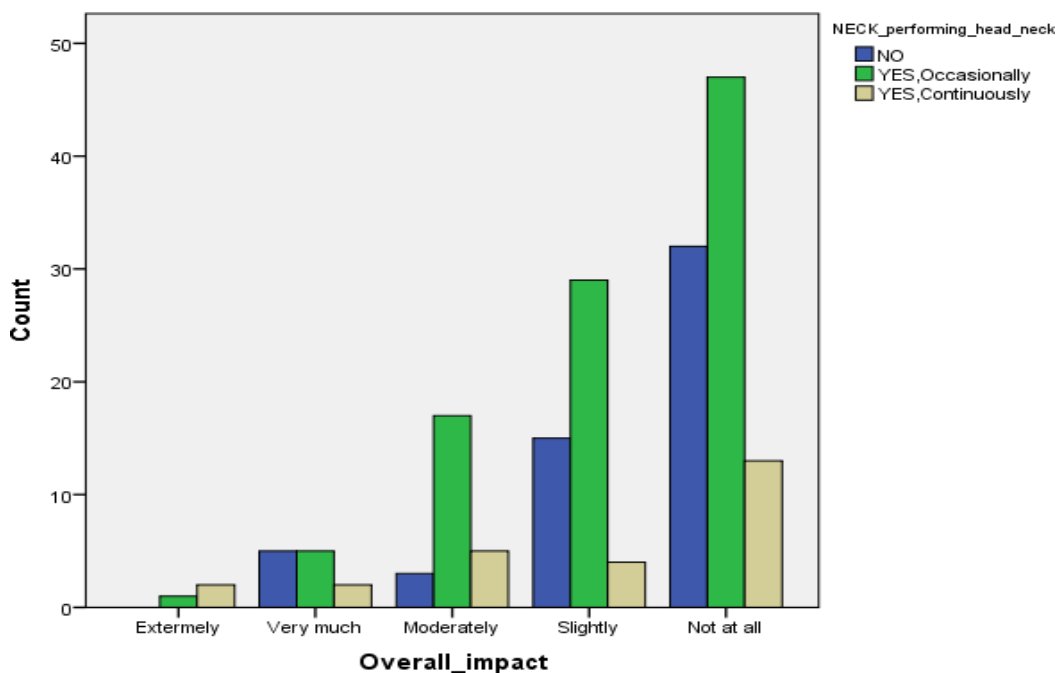


Figure 1 Overall impact of MSK pain with neck and head performance

These findings highlight the critical need for ergonomic interventions tailored to the specific needs of surgeons, particularly those in the earlier stages of their careers who may be at greater risk due to less optimal work postures and higher physical demands of surgical procedures. The study underscores the importance of ongoing ergonomic assessments and interventions to mitigate the long-term impact of musculoskeletal disorders among surgeons.

DISCUSSION

The discussion of the cross-sectional study underscores the significant association between head and neck performance activities and the prevalence of musculoskeletal pain among surgeons, a finding that aligns with existing literature on occupational health(3). Surgeons who engage in tasks that involve extensive neck and head movements are at a heightened risk of developing musculoskeletal disorders, corroborating earlier findings that ergonomic risk increases with specific postural demands during surgical procedures. Although the association between shoulder and back pain and ergonomic risk was less pronounced in this study, these areas still contribute to the overall burden of work-related musculoskeletal symptoms. Research by other scholars has supported these findings; a study highlighted that surgeons often report musculoskeletal pain, with plastic surgeons experiencing a particularly high incidence of discomfort, likely due to the nature of their procedures(28). Further compounding this issue, younger surgeons tend to exhibit higher rates of these symptoms due to less developed job skills and insufficient practice, which can lead to poorer ergonomic practices and increased vulnerability to musculoskeletal issues(29, 30). Gender differences also play a critical role, with females typically reporting higher rates of musculoskeletal diseases than males, a disparity that may be influenced by both biological and occupational factors.

Laparoscopic surgery, with its requirement for sustained lumbar flexion and use of intricate instruments, represents a significant ergonomic challenge compared to open surgery. The focus on deeper internal organs during these procedures often necessitates positions that contribute to lower back pain, highlighting the need for ergonomic interventions tailored to the unique demands of different surgical specialties(31). While the study's findings are instructive, the cross-sectional design limits the ability to establish causality between surgical activities and musculoskeletal symptoms. Longitudinal studies could provide a more definitive link and help develop targeted preventive strategies. Furthermore, the reliance on self-reported data may introduce bias, as participants might underreport or overreport their symptoms. Future research should consider objective measures of musculoskeletal strain and incorporate a broader range of surgical specialties to enhance the generalizability of the findings.

Overall, this study contributes to the growing body of evidence that underscores the need for ergonomic assessments and interventions in surgical settings. It highlights the critical areas where surgeons are most at risk and supports the ongoing development of ergonomic tools and practices designed to mitigate these risks, ultimately enhancing surgeon welfare and effectiveness.

CONCLUSION

In conclusion, this cross-sectional study reveals a modest prevalence of musculoskeletal pain among surgeons in Peshawar, primarily attributed to extensive head and neck activities. These activities pose a greater risk compared to other factors such as shoulder and back movements. While the association between ergonomic risk factors and work-related musculoskeletal symptoms shows a very weak significance overall, the impact of head and neck movements stands out as comparatively more substantial. This highlights the need for targeted ergonomic interventions that specifically address the unique challenges posed by the postures required in surgical practices, ultimately aiming to reduce the incidence of musculoskeletal discomfort among surgeons.

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