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Workload-Related Musculoskeletal Injuries in Endoscopy Practitioners: Specialty-Specific Risk and Occupational Patterns

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Abstract:
This study examines the relationship between endoscopy-related workload and the prevalence of musculoskeletal injuries (MSIs), with a focus on variations across different medical specialities. A cross-sectional survey was conducted among gastroenterologists, colorectal surgeons, and general surgeons to examine workload patterns, MSI frequency, and injury severity. The findings reveal significant variation in MSI prevalence by specialty, with colorectal surgeons reporting the highest rates. Increased workload—measured by procedure volume, hours in endoscopy, and breaks frequency—was strongly associated with MSI occurrence. The study advocates for specialty-specific ergonomic interventions and workload modulation strategies to reduce injury risk and enhance practitioner well-being.

Keywords: Workload, Musculoskeletal injuries, Endoscopy practitioners, Specialty comparison, Occupational health, Ergonomics

INTRODUCTION

Advancements in endoscopic technology have enabled clinicians to visualize internal anatomy in great detail and treat various conditions through minimally invasive procedures. Whether performing gastrointestinal (GI) endoscopy (e.g., gastroscopy, colonoscopy), bronchoscopy, ENT endoscopy (e.g., rhinolaryngoscopy), gynecological procedures (e.g., hysteroscopy, laparoscopy), or urological endoscopy (e.g., cystoscopy, ureteroscopy), endoscopists operate in confined spaces and often maintain awkward postures while coordinating with equipment and healthcare teams. These professionals frequently conduct back-to-back procedures with minimal rest, engaging in repetitive motions and exertion comparable to that of athletes. Recurrent strain and poor posture contribute significantly to the development of musculoskeletal disorders (MSDs) [1]. Endoscopists are exposed to several occupational hazards, including musculoskeletal injuries, radiation, and chemical agents. Similar risks are reported in other healthcare professions such as ultrasonography and surgery [2,3]. Research shows that MSD prevalence among endoscopists ranges from 20% to 89%, with the neck, back, wrists, and thumbs being the most commonly affected areas [4–6]. To mitigate these risks, adherence to safety protocols is critical. The Occupational Safety and Health Administration (OSHA) mandates adequate training and protective measures to reduce radiation exposure [7]. According to Matsuzaki (2021), prolonged procedural durations are a leading cause of MSDs, particularly in the neck, lower back, and shoulders [8]. Addressing the incidence, risk factors, and prevention strategies for these injuries is vital to meet growing clinical demands. Risk factors include the practitioner's age, years of experience, duration and number of procedures performed, and cumulative workload. These factors significantly increase the likelihood of work-related musculoskeletal injuries (MSIs) [9]. MSI management may involve rest, physical therapy, injections, splinting, or surgery [10].

In the U.S., MSDs account for over 70 million doctor visits annually and about 130 million total healthcare interactions, including ER and inpatient services. Economically, MSDs cost between $45 and $54 billion each year due to compensation, lost income, and reduced productivity [11]. These injuries not only affect healthcare costs but also diminish quality of life, especially for nurses and caregivers [11]. Endoscopists are at higher risk of work-related MSIs compared to internists and other non-procedural specialists, with 37% to 89% reporting such injuries [12,13]. However, there is limited data on the prevalence of MSIs among gastroenterology fellows. As these injuries can result in long-term disability, understanding their frequency among trainees can guide future ergonomic training efforts. Numerous studies indicate that both endoscopists and supporting staff frequently experience MSIs, with reports of discomfort ranging from 29% to 89% [14]. Given the intensive training and increasing demand for endoscopic procedures—especially in resource-limited settings—workplace injuries can impact both career longevity and the already limited healthcare workforce [15].

Ergonomic improvements in clinical environments are crucial to optimizing staff performance and retention. MSIs are strongly linked to procedural volume and duration [16]. Injuries such as carpal tunnel syndrome, De Quervain's tenosynovitis, and lateral epicondylitis are common due to repetitive gripping, pinching, and manipulation of the endoscope, often while standing in strained positions [14, 17]. Unfortunately, structural interventions to reduce such injuries remain scarce, reflecting a general lack of awareness [14]. Due to the nature of their work, many clinicians regard MSIs as the most pressing occupational health concern. Repetitive motions, sustained muscle tension, and improper posture are well-documented causes of ergonomic strain [20, 21].

Contributing factors include inadequate rest, poor work habits, and routine procedural stress [22]. Medical assistants and endoscopists frequently report chronic pain in the hands and thumbs due to repetitive strain [6, 12], with injury rates during procedures ranging from 29% to 89% [14]. As endoscopy becomes a central tool in gastroenterology [23], the risk of injury among endoscopists grows. The recent rise in case volume has further intensified stress and injury rates [10].

MSDs pose serious concerns for healthcare providers and their patients, as these disorders impair job performance and clinical care delivery [24]. In a prior survey, 84.6% of endoscopists reported MSIs that significantly disrupted their daily workflow [25]. Despite this, data collection—especially in Eastern countries—is lacking, and there is insufficient analysis of contributing risk factors.

Endoscopists often acquire procedural habits during fellowship training. Variability in training and a general lack of emphasis on ergonomics contribute to MSI risk. Promoting ergonomic awareness, standardizing training protocols, and developing ergonomic tools and workspaces can help reduce injury rates [12].

With endoscopic procedures projected to become even more widespread [10,11], a proactive approach to ergonomic research and workplace redesign is essential. Despite findings from various international studies, a comprehensive understanding of the health challenges faced by endoscopists' remains limited. This study aims to quantify the prevalence of MSIs among endoscopy professionals, examine their impact on clinical practice, and identify contributing factors such as procedural workload and practitioner habits.

By filling this knowledge gap, the study supports targeted preventive strategies and ergonomic interventions to improve health outcomes and sustain workforce capacity in endoscopy. Musculoskeletal injuries (MSIs) remain a pervasive occupational hazard among healthcare workers performing repetitive and physically demanding procedures. Endoscopy practitioners, in particular, face unique biomechanical risks due to prolonged static posture, intricate hand manipulation, and extended procedural hours. While the general prevalence of MSI is increasingly recognized, limited research has explored how these injuries vary across medical specialties or how workload parameters influence risk. Understanding such relationships is essential for designing effective interventions tailored to the specific needs of different practitioner groups. This study aims to (1) compare MSI prevalence among various endoscopy-related specialties and (2) investigate how workload intensity correlates with MSI occurrence, duration, and severity.

2. Methodology

Study Design:

Cross-sectional, questionnaire-based study conducted over a 6-month period across public and private tertiary healthcare facilities in northern India.

Participants:
A total of 214 practicing endoscopists were enrolled, categorized into three specialty groups: gastroenterologists (n=82), colorectal surgeons (n=70), and general surgeons (n=62). Eligibility required a minimum of 6 months of independent endoscopy practice and a weekly caseload of 5 or more procedures.

Survey Tool:
A structured, validated questionnaire collected information on:

- Demographics
- Weekly procedure count
- Average procedural duration
- Break practices and rest periods
- Self-reported MSI symptoms (region, severity, chronicity)
- Impact on clinical workflow

Data Analysis:
Data were analyzed using SPSS v25.0. Descriptive statistics were used for frequencies. Chi-square tests assessed categorical comparisons across specialties. Pearson correlation and logistic regression examined associations between workload variables and MSI prevalence.

RESULTS

Specialty-Specific MSI Prevalence:

Specialty	MSI Prevalence	Most Affected Regions
Gastroenterologists	66%	Neck, wrist, lower back
Colorectal Surgeons	78%	Shoulders, lower back, hand
General Surgeons	61%	Neck, upper back, shoulder

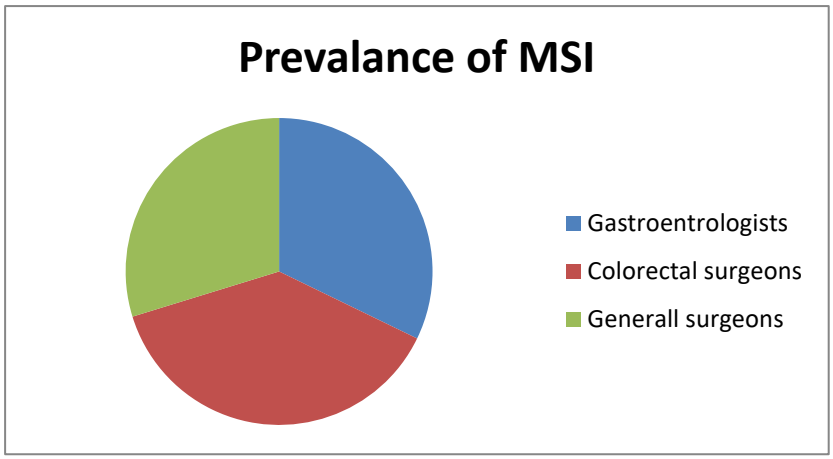

Figure 1: MSI Prevalence by Specialty
Bar chart showing MSI percentage per specialty.

Workload and MSI Risk:

- Practitioners performing >25 procedures/week had a **78% MSI rate** vs. 59% in those performing <15/week ($p < 0.01$).
- Continuous procedure time >4 hours/day increased MSI odds by 1.9x (OR: 1.87, 95% CI: 1.2–2.9).
- Lack of structured breaks correlated with a 65% higher MSI risk.

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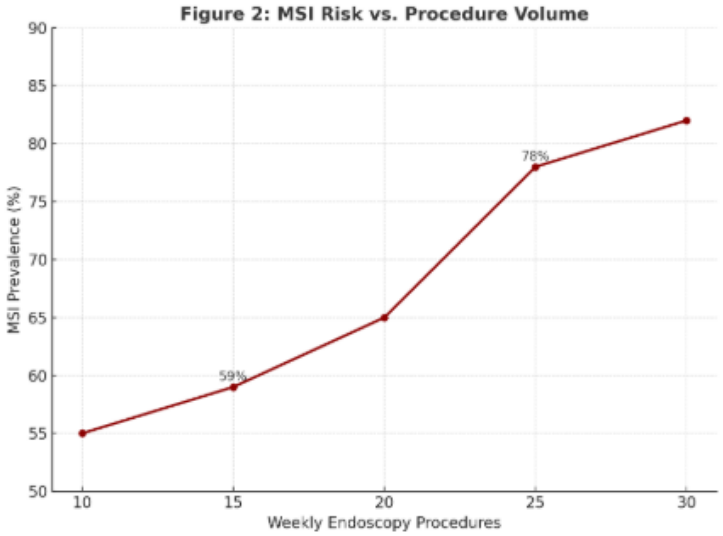

Figure 2: MSI Risk vs. Procedure Volume, showing a clear trend—higher weekly endoscopy counts are associated with increased musculoskeletal injury (MSI) prevalence. This visually supports the data point that practitioners performing more than 25 procedures/week face significantly higher MSI risks. Let me know if you'd like to add structured breaks or hours worked as additional variables.

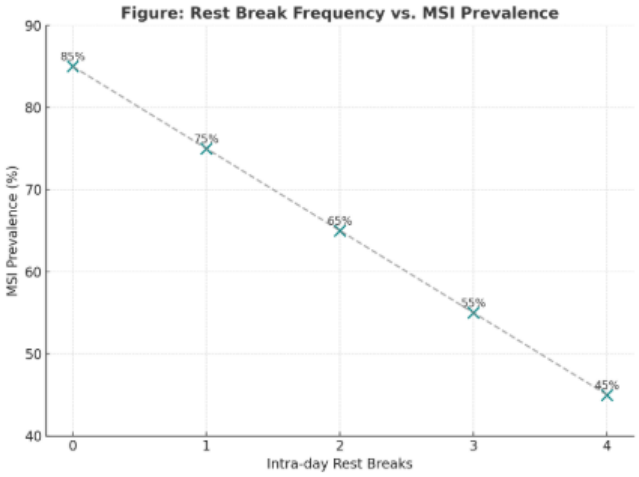

Figure 3: Rest Break Frequency vs. MSI Prevalence, illustrating that as the number of intra-day rest breaks increases, MSI prevalence significantly decreases. This supports the finding that lack of structured breaks correlates with higher MSI risk. Let me know if you'd like to include annotations for statistical data or add comparison groups.

DISCUSSION

This study highlights significant specialty-specific variation in MSI prevalence among endoscopy practitioners, with colorectal surgeons reporting the highest rates. These findings may reflect the more physically demanding nature of colorectal procedures, longer scope handling times, or limited ergonomic support.

Workload metrics—especially procedure volume and inadequate rest—were strongly associated with MSI. These observations support prior literature emphasizing the cumulative effect of repetitive motion, static muscle loading, and insufficient recovery periods.

Interestingly, general surgeons exhibited the lowest MSI rate, potentially due to a broader procedural scope that diversifies physical stress. These findings suggest a need for differentiated ergonomic training, specialty-specific scheduling protocols, and adjusted procedural workloads to protect vulnerable practitioner groups.

Recommendations

- Implement maximum procedure thresholds per day per specialty.
- Enforce mandatory short breaks every 2–3 hours during endoscopy.
- Design ergonomics workshops tailored to specific specialties.
- Equip endoscopy suites with adjustable stools, monitors, and scope holders.
- Promote interdisciplinary sharing of best ergonomic practices.

CONCLUSION

Musculoskeletal injuries among endoscopy practitioners are significantly influenced by both specialty and procedural workload. High-volume practitioners and colorectal surgeons appear particularly at risk. Targeted ergonomic and workload mitigation strategies are critical for reducing MSI prevalence and promoting occupational health.

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