Medical Journal of Europe

ISSN: 2995-7907 doi: 10.5281/zenodo.16742946

Prevalence and Associated Factors of Ergonomic-Related Musculoskeletal Disorders Among Urologists Practicing in Ethiopia 2024

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Article Info

Received: 24 July 2025

Revised: 31 July 2025

Accepted: 31 July 2025

Published: 3 August 2025

Keywords:

Musculoskeletal Disorders (MSDs, Ergonomics, Urologists, Prevalence.

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ABSTRACT

This study aims to assess the prevalence of ergonomically related musculoskeletal injuries among urologists and final year trainees practicing in Ethiopia. Additionally, the factors associated with these injuries were analyzed. An online version of the questionnaire was sent to Urologists who perform open, endoscopic/percutaneous and laparoscopic surgeries throughout the country. Of the 77 respondents, 52 (66.7%) urologists reported that they have musculoskeletal disorders. The common sites of most severe pain were reported to be the lower back, neck and upper back. For 40 (76%) of the surgeons, their pain started during their training and years of practice was found to have a significant association with the development of musculoskeletal injuries (OR = 0.27, P-value = 0.02). Additionally, the minimum number of breaks taken during a two-hour surgery was also found to be a significant risk factor for these injuries (OR = 0.33, P-value=0.026). Only 1.9% of participants reported their injuries to their institution, and only 5.1% received training in sound ergonomic techniques. A High prevalence of ergonomically related musculoskeletal injuries was found among urologists practicing in Ethiopia. Most urologists lack training on proper postures and preventive practices. Hence, we recommend the incorporation of ergonomic education in the urology training curriculum to improve awareness and prevent these injuries.

INTRODUCTION

Background

Surgery is a physically demanding profession that requires manipulation of the surgeon's own body to get easy access to the surgical field (1). Despite the widespread application of the science of ergonomics and the mechanical workload on urologic surgeons, only programs about ergonomic practices have been implemented for them (3). In Ethiopia, the total number of practicing urologists is estimated not to exceed 90. Considering the small number, it is easy to imagine the impact of the loss of work days on the service provided. Despite this fact, no published data are available regarding the magnitude of the problem among Urologists, not just in Ethiopia but in the entire African continent.

Statement of Problem

Around 75% of urologists practice open, endourologic and laparoscopic surgeries, and 62% reported having musculoskeletal (MSK) pain or discomfort associated with the performance of their work (4,5). More than two-thirds (68%) said they took NSAIDs to reduce MSK pain while performing surgery (6). Twenty-two percent of injured surgeons missed work, and 35% performed fewer operations while they were recovering from their injury (7). The vast majority of urologists

have experienced ERMD, resulting in the need for medical and surgical management (2) Not only that, some urologists were forced to take frequent leaves of absence and even retired early because of their pain (8).

Significance of the Study:

To the best of our knowledge, there is no published local data about the magnitude and factors responsible for ergonomic injury in urologists practicing in the country. This study aims to inform urologists about the factors associated with the occurrence of this problem, thereby enhancing their efficiency and longevity. It will also serve as a baseline dataset for researchers interested in conducting further studies in urology and other similar surgical disciplines. Moreover, it should also serve as a guide for policymakers when designing operating rooms to consider the safety of the urologist.

Literature Review

Ergonomics is defined as the discipline concerned with the understanding of interaction between humans and other inanimate elements of the system. The word is derived from the two Greek words ergon (labor) and nomia (arrangement), denoting the arrangement of the working environment (1).

Several recommendations are available to decrease injuries and improve productivity. These recommendations offer a better chance of re-structuring the OR layout and implementing sound posture by the urologist. For this reason, it is in everyone's best interest to incorporate training on sound ergonomic practices into the urology residency curriculum (2).

A study in Japan demonstrated that the decrease in general surgeons is mainly due to mid-career job separation. Overwork, medical lawsuits, and low wages have been identified as reasons for the shortage of doctors working in the fields of surgery and obstetrics. Still, it would be difficult to imagine that these factors would be significantly different between general surgery and other specialties (3).

In another survey, fifty-six reported minor to moderate discomfort, and it was significant in 29%. Two respondents said their pain or discomfort ended their careers and led to early retirement (7,9).

The most frequent areas of discomfort are reported to be the neck (58–70%) and back (around 30 to 60%), followed by the shoulder. Those performing open surgery were said to be likely to complain of back and neck pain, possibly due to the deep nature of the pelvis and also the need for headlights. Endourology procedures — such as TURP/TURBT, URS with lithotripsy, and PCNL—were also reported to be risk factors for ERMD (8).

A study involving 4,696 participants, with a response rate of 76.4%, found that training in urology was associated with an increased relative risk of burnout compared to internal medicine training. There was a significant association between burnout and physical discomfort (10).

In a worldwide study that involved 701 urologists (the most extensive surgical ergonomic study), the authors found that 45% of participants had pain on their back and 24% reported neck pain. There was a correlation between complaints of pain and surgeon BMI. Exercise was found to have a protective effect. Those who exercised more than four times per week complained less than those who exercised two or fewer times per week (6).

Urology, as well as the medical profession in general, will face challenges in the next decade that will likely influence the way medicine is practiced for the next half of the century. New paradigms of training coupled with reimbursement pressures will continue to evolve. The urological workforce is deficient in caring for an aging population, many of whom do not practice healthy lifestyles. All of this is occurring in an increasingly litigious society with the expectation that research funding will be markedly constrained (11).

Optimal ergonomics is essential to improve clinical performance and longevity among urologists, as poor ergonomics can contribute to work-related injury and physician burnout. While a majority of urologists experience muscular injury throughout their career, trainees are significantly more affected (12).

In one study, where 64% of the surgeries were oncologic, ERMD related to minimally invasive procedures was reported in 88% of the participants. Fifty-two percent reported continuous pain. Some of the associated factors identified were small-sized gloves, shorter stature, and female sex. Sixteen percent of those suffering had received training in ergonomic techniques (4).

Specific procedures also appear to carry a greater risk of musculoskeletal injury. Minimally invasive surgery, in particular, has been reported as carrying a greater risk of musculoskeletal injury (13).

Younger urologists with shorter duration of practice appeared to be at a higher risk of MSK injuries compared to those with more than 5 years of experience (14). One study showed that taking 15 to 20 seconds of micro breaks every 20 minutes during their surgeries was associated with decreased risk of developing these injuries (15). Some of the practices encouraged as sound included dropping the shoulders to take the load off the neck and back, and avoiding shifting weight bearing to one side of the body at all times. Additionally, sitting was found to be associated with less pain when compared with the standing position (8).

Experience was also found to be a protective factor. Measured by different metrics like number of cases (more than 50 cases per year or more than 250 cases in total), or years of practice, more experience was consistently associated with decreased MSK pain (2). Musculoskeletal complaints were significantly greater in the junior surgeons than in seniors ($P = 0.002$). Surgeons having <2 years of surgical experience were significantly more affected ($P = 0.03$) (16). The possible explanation could be a lack of knowledge leading to the assumption of unsound postures for a long duration, which can cause more muscle tension during the early period of skill acquisition (5,16,17).

In a study conducted in South Africa, nearly two-thirds of the participants reported suffering from ERMD. Of these, back pain accounts for more than half (18). To the best of our knowledge, there are no studies published in Ethiopia or even in Africa on the magnitude of the problem, specifically among urologists.

Objectives

General Objective

To assess the prevalence and associated factors of ergonomically related musculoskeletal disorders among urologists and final year trainees practicing in Ethiopia.

Specific Objectives

1. To estimate the prevalence of ergonomically related musculoskeletal disorders among urologists and final-year trainees practicing in Ethiopia.

2. To analyze the associated factors of ergonomically related musculoskeletal disorders among urologists and final year trainees practicing in Ethiopia

METHODS

Study Area and Study Period

This study was conducted from March to September 2024 on all urologists and final year urology trainees practicing in Ethiopia.

Study Design

A cross-sectional Study design was employed.

Population

Source Population:

The source population consisted of all urologists, final-year urology residents, and fellows practicing open, endourologic, and laparoscopic services throughout Ethiopia.

Study Populations:

The study population consisted of all urologists, final-year urology residents, and fellows practicing open, endourologic, and laparoscopic services throughout Ethiopia.

Inclusion & Exclusion Criteria:

- All consented Urologists and final year urology trainees currently practicing in any of the hospitals in Ethiopia with operating rooms providing urology surgery services were included.

Variables

Dependent Variables

Symptoms of ergonomically related musculoskeletal injuries.

Independent Variables

Characteristics of independent variables are given on Table 1.

Table 1. Characteristics of independent variables.

Variables	Description.
1) Socio-demographic data	Age, sex, height, weight, dominant hand, Years of practice
2) Awareness & Access to Proper ergonomic training in the OR.	Lack of Training in ergonomically sound techniques in the operating theatre
3)Operating characteristics	Number of operations per week, duration of surgery, type of procedure, operating positions (Standing, sitting).
4)Prevention practices	Duration of exercise, duration of sleep, practice of taking micro breaks 1 to 2 minutes every 20 to 40 minutes while on procedure, exchanging uncomfortable positions b/n team members
5)OR set up	Adjustable Operating table availability, Comfortable OR shoes, and Manual patient transfer

Sampling and Data Collection Methods & Tools

According to the 2024 record of the Urology Society of Ethiopia (USE), there were 85 actively practicing urologists, including final trainees, in the country. An online self-administered questionnaire was administered to all of them, and a reminder was sent twice for those who did not respond. Few urologists were approached in person, and paper format was

used for those who did not reply after multiple reminders. The final response rate was found to be 78 (91.8%).

Data Processing and Analysis

Data were collected from participants using Google Forms, which were then imported into SPSS version 26 for cleaning, editing, and summarization using both descriptive and analytical methods.

Binary logistic regression analysis was employed to explore the association between the occurrence of musculoskeletal disorders and various collected factors. A p-value of 0.05 was used as a cutoff point to define statistical significance.

Data Quality Control

Various precautions and appropriate data quality control mechanisms were used in all data management processes to ensure the quality of data. These included pre-testing the data collection tool, close supervision of the data collection process, and verification of completeness.

Ethical Consideration

Ethical clearance was obtained from the research and ethics committee of AAU, College of Health Sciences, School of Medicine. All identifying data of the participants were kept confidential and will remain so.

Operational Definitions

Ergonomic related musculoskeletal disorders (ERMD): Any self-reported injuries, disorders, discomfort or pain of the muscles, nerves, tendons, joints, cartilage and spinal discs in which the work environment and performance of work contribute significantly to the condition; and/or the condition is made worse or persists longer due to the work conditions (8).

Micro breaks: A 1.5–2 min break with guided micro break exercises carried out intraoperatively in the sterile field at medically convenient 20–40 min intervals.

Occasionally: Occurrence of the particular event (response) at least once per month but less than once per week.

RESULTS

Demography

A total of 78 participants were included and analyzed in this study. Seventy-seven (98.8%) of them were males. The median age in years of the participants was estimated to be 35.0 (IQR = 6.3). The median BMI is 24.2 (IQR = 2.9). Sixty-five percent of the participant urologists have a BMI between 18.5 and 24.9 Kg/m², and 35% have a BMI of 25 or higher (Table 2).

The majority of the participants are right dominant, 76(97.4), with only two surgeons reporting to be ambidextrous.

Table 2. Description of the age, height and weight distribution of the participants.

	Age (in years)	Height (in cm)	Weight (in Kg)	BMI (Kg/sqm)
Median	35.0	175.0	74.0	24.2
IQR	6.3	6.0	6.9	2.9

Operating Characteristics

Among the participants, 46 (58.9%) were in their early practice of 1 to 5 years as a urologist, followed by 15 (19.2%) final year trainees (Figure 1). The years of experience was found to have significant association with ERMD, (OR = 0.266, P-value = 0.022).

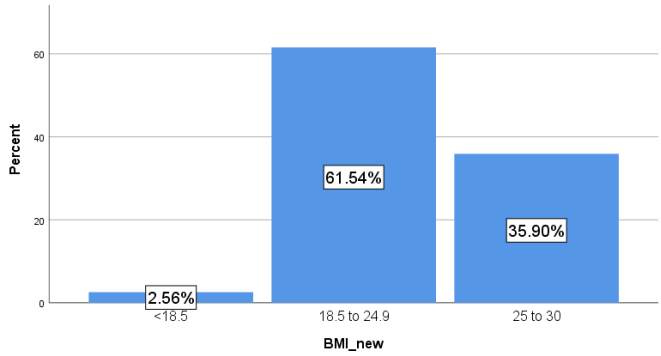

Figure 1. Distribution of body mass indexes.

Thirty-seven (47.4%) of participants reported that they perform five or more procedures per week. The number of procedures performed per week by a urologist was also found to have a statistically significant association with having ERMD (OR=0.203, P value = 0.022). For the majority, 51(65%), of the urologists, around 10 to 30% of their procedures last for >3 hours and 7(9%) urologists responded that they operate for >3 hours 40 to 60% of the time. The preferred position to operate by 58(74%) is the standing position, with only 7 (9%) urologists using both standing and sitting positions. The commonly utilized surgical technique for 32(41%) of the urologists was a combination of both open and endoscopic approaches (including percutaneous technique), with the endoscopic-only approach (including percutaneous technique) being the second most common approach used by 24 (30.8%) urologists. Twenty-one (26.9%) of the participants use an open approach only. (Figure 2 and 3)

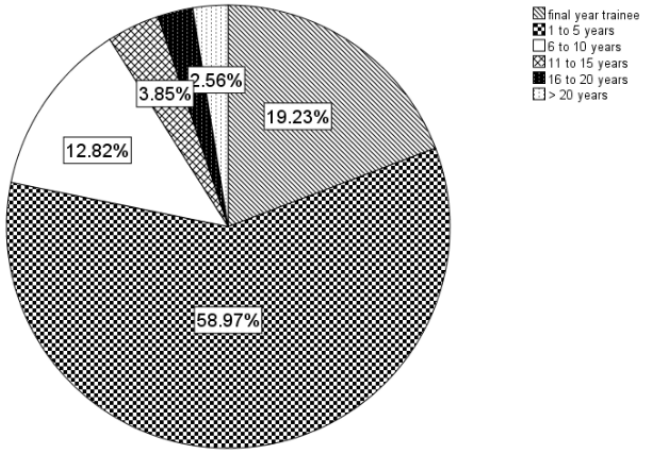

Figure 2. Years of experience.

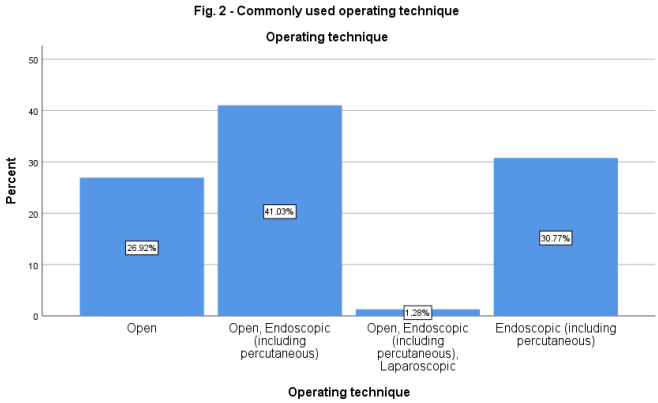

Figure 3. Commonly used operating technique.

Prevalence and Associated Factors of MSK Disorder

Among the respondents, 52 (66.67 %) reported suffering from work-related musculoskeletal disorders (Figure 3). In 44(84.6%) urologists, the pain persisted beyond the operating theatre (OT) time, while the remaining 8(15.4%) experienced pain only in the OT (Figure 4).

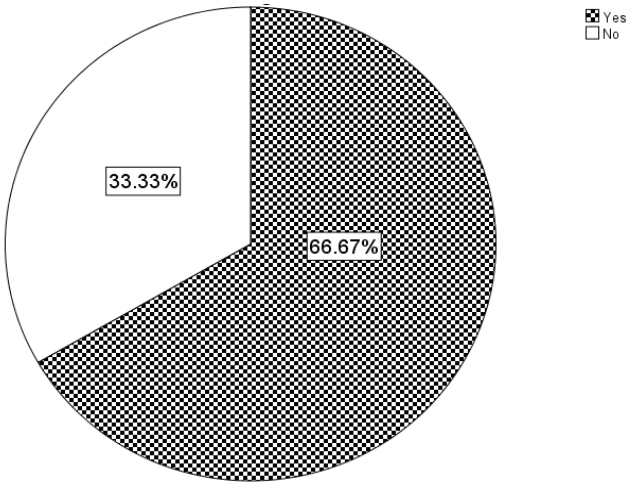

Figure 4. Prevalence of Distribution

The position associated with the worst pain was the standing position for 44(88.5%) of the symptomatic participants. About 32 (61.5 %) experienced the pain 1 to 2 times per week, 17 (32.7%) experienced it once per month, and three surgeons (5.8%) reported suffering from the symptoms three or more times per week. Twenty-seven (51%) of the symptomatic group reported that their symptoms sometimes affect their work, and half of them are sometimes affected in their daily routine. The most common reported site of pain is the lower back in 31 (59.6 %), followed by cervical pain in 14 (26.9%) (Figure 5).

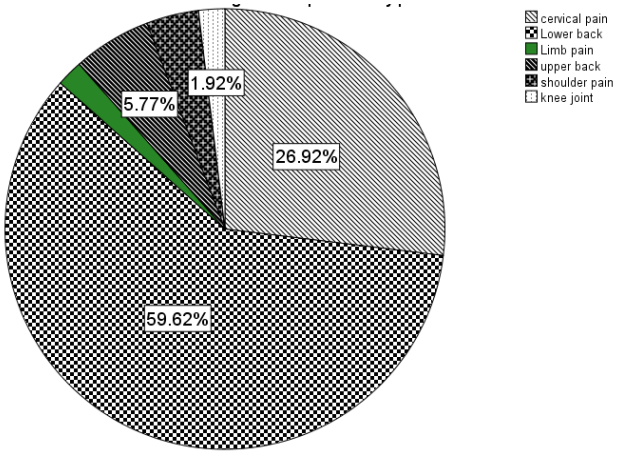

Figure 5. Most painful body parts.

For 40 (76%) of the surgeons, their pain started during their training (residency/fellowship), followed by 6 (11.5%) surgeons with symptom onset in <5 years of practice. Around 27 (59%) of them reported moderate symptom scores during the worst episodes, with 2(2.6%) surgeons having severe pain scores (using NRS). Even on a regular day, 3 (6%) have moderate pain. Forty-nine (62.8%) of the affected participants suffer from mild severity musculoskeletal pain on a regular day. Three (5.8%) surgeons were diagnosed by a clinician for their WRMSD, with 2 (3.8%) urologists having lumbar disc prolapse and 1 (1.9%) urologist with "Shoulder joint problems" (Figure 6).

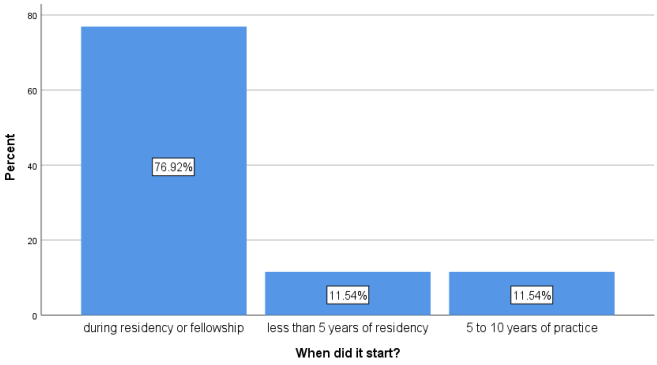

Figure 6. Timing of onset of pain.

Twenty-nine (56%) of the suffering participants use analgesics for their pain. Of these, 4 (14%) take medications once per week, and 25 (86.2%) take them occasionally (Table 2). Eleven

(21.2%) urologists required physical therapy for their symptoms. Not only that, 12 (23%) were forced to take a sick leave (Table 3), with eight surgeons (72.7%) requesting up to 3 days and four surgeons requesting more than 3 days (Table 4). Only 1 (1.9%) participant reported the symptoms to their institution. No participant has undergone any surgery for their complaint.

Table 2. Analgesic intake frequency.

	Frequency	Percent
Occasionally	25	86.2
Once per week	4	13.8
Total	29	100

Although rarely, 17 (21.8%) of the symptomatic group reported that their decision on surgical approach is affected by their symptom level. Four surgeons (7.7%) are affected sometimes, and one surgeon (1.9%) reported that they are affected often.

Tables 3. Sick leave requirement.

	Frequency	Percent
Yes	12	23.1
No	40	76.9
Total	78	100

Table 4. Sick leave requirement.

	Frequency	Percent
Up to 3 days	8	72.7
3 days to 2 weeks	4	23.3
Total	12	100

Associated Factors

Among the participant urologists in this study, 60 (76.9%) of them get 6 to 8 hours of sleep per day, followed by 12 (15.4%) sleeping for 4 to 6 hours per day. Only 6 (7.7%) surgeons reported sleeping for >8 hours per day. When queried about their exercise habits, 39 (50%) of the participants reported not having a regular exercise routine. However, 21 (26.9%) urologists reported that they exercise for 1 to 2 hours per week, and 12 urologists (15.4%) work out for >2 hours per week. Only 3 (5.2%) of the urologists have ever received any training on ergonomically sound techniques (Figure 7).

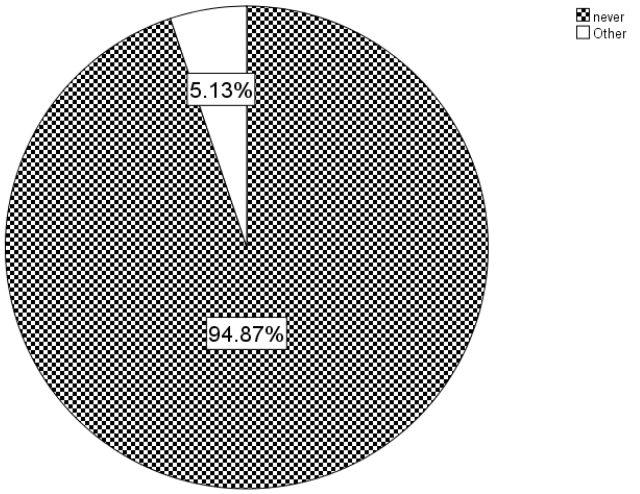

Figure 7. Training on ergonomy.

Preventive Practices

During operations, 22 (28.2%) surgeons do not habitually make any adjustments, 8 (10.3%) perform postural adjustments, and 5 (6.4%) adjust the table height in addition to making postural adjustments. Only 2 (2.6%) surgeons practice all the necessary postural adjustments. When questioned about their OT table, about 20 (26 %) participants mentioned they have their OT tables functional >50% of the time, 15(19.2%) surgeons have it functional <25% of the time and only 16 participants (20.5%) get functional tables on >75% of their surgeries. Moreover, even if they have functional tables, only 20 (25.6%) request adjustments often. For optimal visualization of the surgical field, 29 (37.2%) of the surgeons responded that they usually have adequate light sources in their OT. 18(23%) urologists rarely have a sufficient light source. Loop magnification is seldom used by 53 (68%) of the participant urologists, and 18 (24%) use it occasionally. Only two surgeons reported using headlights often. Thirty-nine (50%) of the urologists almost always manually transfer their patients. Thirty-four urologists (43.6%) take micro breaks two or more times in two hours of surgery, and 44 (56.4%) take breaks only once or do not take breaks at all. During their surgeries, one-fourth of the surgeons do not have the practice of exchanging uncomfortable positions among their team members at all. The minimum number of breaks taken during a two-hour surgery was found to be a significant risk factor for ERMD (OR = 0.33, P-value=0.026) (Table 5).

Table 5: Association of the dependent variable with various independent variables.

	Regression coefficient (β)	P – value	OR (exp(β))	95% CI
Years of experience	-1.324	0.022	0.266	0.092 – 0.988
No. of operations	-1.593	0.003	0.203	0.070 – 0.591
Intra OP Breaks	-1.106	0.026	0.331	0.1125 – 0.877
Age	0.019	0.125	1.019	0.916 - 1.135
BMI	0.128	0.243	1.14	0.819 - 1.578
Sleep duration	0.009	0.247	1.009	0.942 - 1.081
Exercise	-0.0803	0.122	0.921	0.829 - 1.022

DISCUSSION

The majority of urologists (66.7%) experience work-related musculoskeletal disorders. This finding is in agreement with the South African study on ergonomics (18), in which they reported a 69.7% prevalence. However, it is lower than the most extensive ergonomic study on endourology, which found a prevalence of 85%, and the report by Szeto et al., which found a prevalence of 90% (19).

The body part associated with the worst pain was found to be the lower back (59.6%) in our study, followed by cervical pain in 27%. These findings differ from the European research on ergonomics (20), which found the neck to be the most commonly reported site (59.3%). Considering both studies, there is an indication that urologists have a significant mechanical workload on their backs and necks (5,21).

Younger urologists with shorter duration of practice appeared to be at a higher risk of MSK injury compared to those with more than 5 years of experience. In this study, the likelihood of developing ERMD among urologists with more than 5 years of experience was found to be 73.4%. This finding is in line with multiple international studies (2,4,5,9,16). Musculoskeletal complaints were significantly greater in the junior surgeons than in seniors (P = 0.002). Surgeons having <2 years of surgical experience were significantly more affected (P = 0.03) (17). The possible explanation could be a lack of knowledge leading to the assumption of unsound postures for long abjurations, which can cause more muscle tension during the early period of skill acquisition (9,17,22). Similarly, the odds of having ERMD were found to be 80% less in those performing >= 5 per week compared to those who perform <5 procedures per week.

Leave of absence from work due to musculoskeletal pain occurred in 12/55 (23%) of participants. This number is almost comparable to the European data, which stated a 24% sick leave rate. In a human resource-scarce country like Ethiopia, this finding should alarm the gravity of the problem (9,17). It is clear from the worldwide literature that the majority of surgeons in general and urologists in particular do not have training in ergonomically sound techniques, either during their education or their practice (22). This is reflected in our study, too, with only around 5% of urologists ever attending any such training. Compared to those taking <2 breaks in 2 hours of procedure, those who take two or more breaks were found to be 66.9% less likely to have ERMD. N. Stylopoulos et al also reported micro breaks are associated with less work-related pain (OR = 0.29, P-value = 0.025).

The limitation of this study includes the reliance on self-reported data and the lack of objectivity in the investigation of the complaints. In addition, the power of the study was limited by the small sample size. The challenge to get a response from urologists practicing outside of the capital also impacted the response rate.

This study showed the high prevalence of musculoskeletal complaints among Ethiopian urologists. It is also clear from the findings that there is a lack of training in ergonomically sound techniques. The majority of urologists do not have the habit of taking micro breaks despite the significant association with ERMD. It is also clear from the findings that there is a lack of training in ergonomically sound techniques and under-reporting symptoms.

Based on these findings, we recommend incorporating courses on ergonomics into residency training and also introducing hands-on training for surgeons in their early practice. Urologists should improve their practice of taking micro breaks while operating. Further research should be conducted to identify the factors associated with an increased risk of injury and to investigate the reasons behind the under-reporting of ERMD observed in the study.

Acronyms and Abbreviations

AAU Addis Ababa University

ERMSD Ergonomic-related musculoskeletal disorders

MSK Musculoskeletal System

NRS Numeric Rating Scale

OT Operation Theatre

TASH Tikur Anbessa Specialized Hospital

USE Urologic Society of Ethiopia

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