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Research Article

Work-related musculoskeletal disorders and ergonomics among gynecologists

Jinekologlarda işe bağlı kas-iskelet hastalıkları ve ergonomi

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Abstract

Aim: Work-related musculoskeletal disorders (WRMSD) have been a prevalent health issue among gynecologists. The current nationwide survey aimed to establish the prevalence and predictors of pain and WRMSD among gynecologists in Turkey, as well as their influence on family, social, and professional life.

Material and Methods: The current prospective descriptive study was conducted as a national survey including gynecologists operating as a specialist for at least two years in a tertiary hospital with more than 500 beds.

Results: The survey was completed by 286 (131 female) respondents out of a total of 390 participants. The locations of pain were as follows: neck (49.3%), upper back (49.3%), lower back (44.4%), shoulder (43.49%), hand/fingers (34.8%), thumb (11.2%), wrist (21.9%), hip (17.3%), knee (26.8%), and foot (17.8%). 58.7% of the gynecologists discovered at least one diagnosis of WRMD. Female surgeons were at threefold risk of upper back pain (β: 3.546 (%95 confidence interval (CI), 1.304-9.645; p=0.013), and at least two regions of pain (β: 3.847; CI:1.241-11.928; p=0.020). Left dominant hand increased risk of pain in the elbow (β:11.360, CI: 2.721-47.422; p=0.001), hip (β:1.155, CI: 1.004-1.283; p=0.045), and pain in the more than two regions (β:6.786, CI: 1.246-36.967, p=0.027). Exercise hours per week were found a protective factor for upper back pain and pain in more than two regions (β:1.198, CI:1.005-1.355, p=0.013; β:1.286, CI: 1.088-1.441, p=0.007).

Conclusion: WRMSD are potentially affecting the gynecologist's quality of life, income and professional life. Future research can be conducted to increase awareness and prevention from WRMSD among gynecologists.

Keywords: work related musuloskeletal disorders, pain, gynecologist, ergonomics, operation

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Öz

Amaç: İşe bağlı kas-iskelet hastalıkları (İBKİH), jinekologlarda sık görülen halk sağlığı sorunudur. Ulusal anket çalışmasında Turkiye'deki jinekologlarda İBKİH ve ağrı sıklığı ve prediktif faktörleri araştırılarak bunun jinekologların aile, sosyal ve iş hayatı üzerine etkisini belirlemek amaçlanmıştır.

Gereç ve Yöntemler: Prospektif tanımlayıcı anket çalışmasına Turkiye'de 500 yataktan fazla kapasitesi olan üçüncü basamak hastanelerinde çalışan ve en az 2 yıllık uzman olan jinekologlar çalışmaya dahil edilmiştir.

Bulgular: Çalışmaya katılan 390 jinekoloji uzmanının 286'sı (131 kadın) çalışmayı tamamladı.Ağrı lokalizasyon sıklıkları sırasıyla şöyledir: %49,3 boyun, %49,3 % sırt, %44,4 bel, %43,49 omuz, %34,8 el/ el parmakları, %26,8 diz, %21,9 el bileği, %17,3 kalça, %17,8 ayak ve %11,2 başparmak. %11,2 başparmak. Katılımcıların %58,7'sinde en az bir İBKİH tanısı mevcuttu. Kadın cinsiyeti sırt ağrısı (β: 3.546 (%95 confidence interval (CI), 1.304-9.645; p=0.013) ve en az iki bölgede ağrı riskini (β: 3.847; CI:1.241-11.928; p=0.020) üç kat arttırmakta idi. Sol el hakimiyeti olan jinekologlarda dirsek (β:11.360, CI: 2.721-47.422; p=0.001), kalça (β:1.155, CI: 1.004-1.283; p=0.045)ve en az iki bölgede ağrı riski (β:6.786, CI: 1.246-36.967, p=0.027) artmaktaydı. Haftalık egzersiz saati arttıkça sırt ağrısı ve en az iki bölgede ağrı sıklığı azalmaktaydı. (β:1.198, CI:1.005-1.355, p=0.013; β:1.286, CI: 1.088-1.441, p=0.007).

Sonuç: Jinekologların yaşam kalitesi, iş hayatı ve geliri iş hayatına bağlı kas iskelet hastalıklarından etkilenmektedir. Bu konuda farkındalık ve korunmak için yeni çalışmalara ihtiyaç vardır.

Anahtar Kelimeler: işe bağlı kas iskelet hastalıkları, ağrı, jinekolog, ergonomi, cerrahi operasyon

Introduction

For decades, work-related musculoskeletal disorders (WRMSD) have been a prevalent health issue among surgeons(1). Repetitive strain injuries can cause damage to the muscles, nerves, and/or joints of surgeons and typically affect the spine, wrist, and hands (2-4). In addition to causing chronic pain, these injuries can have negative socioeconomic effects, a negative impact on the quality of life of the of life, and a negative influence on job satisfaction and productivity (5-8).

Every time a gynecologist performs surgery, whether it be laparoscopic or open, they run the chance of developing WRMSD. The researchers explored the musculoskeletal problems that gynecologists from across the world report (7-13). Unfortunately, these studies had several limitations, including a lack of demographic data, comparative operation methodologies, small sample sizes, and a lack of treatment modalities statistics (5-13). The prevalence of musculoskeletal complaints among surgeons appeared to be primarily due to a lack of awareness and the adoption of ergonomic guidelines (9-13). To our knowledge, only one study dealing with ergonomics among Turkish gynecological laparoscopists has been found (9).

The current nationwide survey aimed to establish the prevalence of pain and WRMSD among gynecologists in Turkey, as well as their influence on family, social, and professional life. To highlight new modalities in ergonomics and the working environment for surgeons, the secondary goals included identifying the predictors of WRMSD and pain.

Material and Methods

Study Participants and Design: Previous survey data were utilized to calculate the sample size for the study (5,7,9,10). A gynecologist operating as a specialist for at least two years in a tertiary hospital with more than 500 beds was required to participate in the survey nationwide. About 5000 gynecologists make up the group, and they come from 51 different Turkish cities, uniformly portraying Turkey. The OpenEpi® sample calculation used a universe of 5000 people, a frequency of musculoskeletal conditions of 85%, a confidence interval of 95%, a goal power of 80%, and a target population of 135 people (14). The local ethics committee (KAEK/2021.09.210) approved this cross-sectional study, which was conducted in accordance with the Declaration of Helsinki. The eligibility requirements were as follows: 1) at least two years of experience as a gynecological specialist in a tertiary hospital, and 2) the absence of clinically diagnosed inflammatory musculoskeletal disorders. Participation was voluntary in the search. Participants who agreed to take part in the study and met the inclusion criteria were required to peruse and sign a written consent form.

Process for Creating and Implementing the Survey: The survey was designed and implemented using the Google Forms Survey Platform by researchers with ten years of experience in gynecology (HT, NAV, NK), public health (MGG), and algology

(SAT). In our institution, pilot testing was conducted with 10 gynecologists; however, their results were not included in our analysis. Emails were sent to 4789 physicians. The survey was completed by 286 respondents out of a total of 390 participants. As part of the survey, written informed consent was obtained from participants.

Survey Form: The survey questions have been built on a comprehensive review of the prior literature (5-13). a) demographics b) operating characteristics c) musculoskeletal pain for a year d) Experience with WRMSD and its diagnosis/ treatment e) Effects of the pain on practice, family, and social life, as well as an awareness of ergonomics. The first component of the questionnaire inquired about the surgeon's characteristics (age, gender, height and weight, dominant hand, glove number, smoking, sleep, and physical activity habits) and years of experience. The second section asked about the duration of operations, benign versus malignant cases, the patient's body mass index (BMI), and the annual number of surgeries. The third- and fourth-part questions were about WMSD and were adapted from a Nordic musculoskeletal questionnaire that was verified in Turkish (Cronbach alfa: 0.78) by Kahraman et al (15). The participant was asked if he or she had pain in the neck/shoulder/elbow/ wrist–hand/upper back/lower back/hip/knee/ankle–foot over the previous 12 months. The participant was then required to respond to questions about the pain's duration, treatment, and impact on daily life and professional life. In addition, we asked the respondent how he or she dealt with the discomfort during the surgery, such as by taking a break, adjusting the monitor position or equipment, or by taking painkillers. The participants were then asked if they had been diagnosed with WRMSD or received treatment for it since their residency.

Statistical Analysis

We performed the statistical analysis with the Statistical Package for Social Sciences (SPSS 23.0 IBM SPSS Inc., Chicago, IL) program. The distribution of the variables was examined using the visual (histogram and probability graphs) and Shapiro-Wilk method, and it was found to fit the non-parametric distribution. Demographic data were presented as numbers with percentage (%) and median with (median with 25.-75. percentile). To determine the statistical difference between paired nominal/categorical data we used Mc-Nemar Test. We used Pearson Chi-Square test or Fisher's Exact test for nominal/categorical data. The Mann-Whitney U test was used to compare the quantitative values of two independent groups. We used binomial regression for determining the factors affect single or multiple pain regions. When creating the model, we used variables that only had statistical differences with pain more than two zones. We tested the model structure with each factor's presence and absence to evade multi-collinearity. And, we used correlation tests with regression variables to control any confounding factors. Statistical significance of p-value accepted as $p<0.05$ at a 95% confidence interval.

Results

Sociodemographic Factors of Participants: Our survey included 286 (131 female) surgeons. The participants' median age was 39.50 (33-62) years, and their mean BMI was 25.35. Most participants were right-handed and wore glove size 7.5 (n = 107). More than fifty percent of the individuals (n=154, %53.8) regularly exercised. The median number of years of experience was 10 (2-40). Most of the surgeons (183/286) mainly conducted open surgery. More benign cases were made annually, according to surgeons (n:223,78%). Many of the surgical patients were either overweight or Type 1 obese. In either open surgery (n:139, %48.6) or laparoscopy (n:117,40.9%), almost half of the participants said that only nurses helped them. Most surgeons favored trocar ipsilateral in laparoscopy (n:207, 75.8%) and were told that the size of the equipment in the operating room was standard (n:256, 89.5%). Most of the participants (n:196, 68.5%) were neither aware of nor educated on ergonomics. The participants' sociodemographic characteristics and surgical experiences are detailed in Table 1.

Pain During/After Surgery: Prevalence and Effects on The Life:Most respondents reported feeling pain in at least one body region. Eleven subjects (3.9%) reported no pain. The locations of pain were as follows: neck (49.3%), upper back (49.3%), lower back (44.4%), shoulder (43.49%), hand/fingers (34.8%), thumb (11.2%), wrist (21.9%), hip (17.3%), knee (26.8%), and foot (17.8%) (Table 1). When asked when they felt pain, 132 of them (46.7%) said after the surgery was over, 35 of them (12.4%) had pain all the time, and 65 of them (23%) said their pain started during the surgery and lasted all day. Most of the participants' pain-relieving maneuvers during surgery involved changing their position (59%%) or the table height (25%) for the patient. Forty percent of respondents neglected the pain during the surgery. Over fifty-five percent of participants received medical treatment for their pain. One-third of the participants received physical rehabilitation

Table 1. Sociodemographic Characteristics of Participants	
Participants	286
Sex (female/total (n, %))	131/286 (54.2)
Age (years) (median with min-max)	39 (28-65)
Height (cm) (median with min-max)	172.0 (150.0-192.0)
Weight (kg) (median with min-max)	75 (44-108)
Body mass index (kg/m2) (mean with standard deviation)	25.35 (±3.70)
Experience (years) (median with min-max) / (median with 25.-75. percentile)	10 (2-40)
Dominant hand (right/total (n, %)	266/286 (93.0)
Glove size no (median with min-max)	7.5 (6-9)
Smoking (active/total (n, %)	83 (29.0)
Exercise regularly (yes/total (n, %)	154 (53.8)
How many hours do you exercise in a week (median with min-max)	3 (1-20)
How many hours do you sleep? (median with min-max)	6 (1-9)
Surgeries: laparoscopy more Open more equal open and laparoscopy	 36 183 67
Number of surgeries in a year (median with min-max)	100 (20-400)
Duration of surgeries (hours) (median with min-max)	2 (1-7)
Surgery type:(n, %) more benign case more malignant case equal	 223 (78.0) 43 (15.0) 20 (7.0)
Body mass index of patients (n, %) normal overweight tip 1 obesity tip 2 obesity morbid obesity	 18 (6.3) 138 (48.3) 101 (35.3) 29 (10.1) 0 (0)
Assistance during surgery:(n, %) Resident, fellow and nurse Resident and nurse Fellow and nurse Only nurse	 50 (17.5) 77 (26.9) 20 (7.0) 139 (48.6)
Equipment size(n, %) standart too small too big	 256 (89.5) 8 (2.8) 22 (7.7)
Awareness about ergonomy in the theater: (n, %) No From residency from congress during profficiency By myself	 196 (68.5) 21 (7.3) 43 (15.0) 1 (0.3) 44 (15.4)
Prevalance of pain regions (n, %) Neck Shoulder Elbow Hand-fingers Thumb Wrist Lower Back Hip Knee Foot	 136 (52.7) 109 (42.7) 26 (9.6) 94 (34.8) 30 (11.2) 59 (21.9) 120 (44.4) 47 (17.3) 72 (26.7) 47 (17.4)

treatment. Fifteen of the respondents had a surgical intervention to alleviate their pain. 7.7% of the participants took a sick day for pain relief. Limitation of movement (49.3%), posture discomfort (44.1%), decrease in patience (34.6%), sleep disorders (32.2%), and decrease in surgery performance (23.8%), anger/irritability (24.1%), concentration deficiency (18.2%), unwillingness in the education of gynecology (teach or learn; 15%), decrease in relationship with family and friends (26.2%), and limitation for hobbies (23.1%) were the most frequently reported effects of pain.

WRMSD Diagnosis and Treatment: Respondents were questioned on the diagnosis and treatment of WRMSD. 58.7% (n = 168) of the gynecologists discovered at least one diagnosis. Myofascial pain/strain/spasm was the most frequently diagnosed (27.6%) and treated (22.0%) condition. Myofascial pain was associated with female sex, smoking, shorter height, more benign cases, and more open surgeries per year (p=0.009, p=0.019, p=0.036, p0.01, respectively). Participants reported lumbar disc herniation/spondylosis at a rate of 21.3%, and 46 of them received treatment. Age (p=0.001), the experience of more than ten years (p=0.001), and the frequency of laparoscopies performed annually (p=0.048) were all associated with lumber disc herniation/spondylosis. Cervical disk herniation/spondylosis was seen in 17.5% of the surgeons, with 38 of them receiving treatment. There was a correlation between cervical disk herniation/spondylosis and age (p=0.007) and more than ten years of experience (p=0.005). The additional WRMSDs mentioned by respondents included lateral epicondylitis (15.7%), shoulder impingement/bursitis/tendinitis (12.9%), carpal tunnel syndrome (7.3%), and cubital tunnel syndrome (7.0%). All these WRMSDs were examined in Table 2.

Risk Analysis of Pain Regions: Logistic regression was used to examine the effect of sex on pain in each region and more than two regions (Table 3-4). Female surgeons were at threefold risk of upper back pain (: 3.546 (%95 confidence interval (CI), 1.304-9.645; p=0.013), and at least two regions of pain (: 3.847; CI:1.241-11.928; p=0.020). Left dominant hand increased risk of pain in the elbow (:11.360, CI: 2.721-47.422; p=0.001), hip (:1.155, CI: 1.004-1.283; p=0.045), and pain in the more than two regions (:6.786, CI: 1.246-36.967, p=0.027). Exercise hours per week were found a protective factor for upper back pain and pain in more than two regions (:1.198, CI:1.005-1.355, p=0.013; :1.286, CI: 1.088-1.441, p=0.007).

Discussion

This is, to the best of our knowledge, the first survey of WRMSD among gynecologists in Turkey, and 58 percent have reported having suffered at least one injury. Being in line with the literature, such a high percentage is alarming (5-10).

The most often reported diagnoses were myofascial pain and lumbar/cervical disk herniation/spondylosis. Myofascial discomfort was correlated with female sex, smoking, shorter height, more benign cases, and more annual surgeries. Spondylosis was associated with age, years of gynecological experience, and number of surgeries per year.

Neck, back, shoulder, hand, and finger pain were common among the respondents. When asked when they were aware of the pain, most of them said after the surgery was completed. During the operation, the participants generally adjusted the table height or their position to ease the pain. The pain experienced during the surgery was overlooked by nearly half of the respondents. More than half of the participants received medical therapy for their pain, as well as physical rehabilitation. The most frequently reported effects of pain were mobility restriction, distress with posture, a decrease in tolerance, sleep disorders, and a decline in surgical performance. The risk variables for pain following surgery were the left dominant hand and the female sex. More hours of exercise per week were found to be a protective factor for pain.

A high rate of WRMSD among gynecologists has previously been observed in various parts of the world, similar to the findings of our study. According to reports, 53% of people in Australia and New Zealand sustained at least one injury (10). In research from China, Europe, and North America (4-9) higher rates of WRMSD, such 85-90%, were discovered.

Previous research has demonstrated a high prevalence of work-related musculoskeletal injuries, including degenerative spinal disease (17%), rotator cuff pathology (18%), and degenerative lumbar spine disease (19%). The neck, arm, shoulder, and back are the most commonly affected areas of their high risk of work-related musculoskeletal discomfort (11-12). As predicted our findings were consistent with previous research.

Previous studies have suggested that women have a higher prevalence of musculoskeletal disorders than males, despite the fact that a limited number of female surgeons participated in these studies (6-10). Our study included nearly fifty percent female respondents. We showed that female sex is a significant risk factor when evaluating muscle pain and disease. We hypothesized that female surgeons may be at a disadvantage in terms of ergonomics in the operating room due to their short height and weaker upper-body strength. Furthermore,

Table 2. Characteristics of Work Related Musculoskeletal Disorders

	Myofacial pain	Carpal tunnel syndrome	Cubital tunnel syndrome	Lateral epicondilitis	Rotatuar cuff syndrome/ tendinitis/burcitis	Cervical disk herniation/spondilitis	Lomber disk herniation/spondilitis	Priformis syndrome	Thumb arthritis
Total (+/total) (n/%)	78 (27.6)	21 (7.3)	20 (7.0)	45 (15.7)	37 (12.9)	50 (17.5)	61 (21.3)	26 (9.1)	33 (11.5)
Got treatment	63 (22.0)	15 (5.2)	12 (4.2)	34 (11.9)	33 (11.5)	38 (13.3)	46 (16.1)	21 (7.3)	23 (8.0)
Sex									
Male (+) (n,%)	33 (21.3)	1 (0.6)	7 (4.5)	24 (15.5)	16 (10.3)	21 (13.5)	33 (21.3)	11 (7.1)	16 (10.3)
Female (+) (n,%)	46 (35.1)	20 (15.3)	13 (9.9)	21 (16.0)	21 (16.0)	29 (22.1)	28 (21.4)	15 (11.5)	17 (13.0)
p:	.009*	<.001*	.074	.899	.152	.057	.986	.202	.484
Age (n=286)									
- (median with 25.-75. percentile)	40 (36-45)	40 (35.5-45)	39 (35-45)	39 (35-45)	39 (35-44)	39 (35-45)	39 (35-44.5)	39 (35-45)	39 (35-45)
+ (median with 25.-75. percentile)	39 (35-46)	39 (35-45)	50 (43.5-57)	42 (37.5-54)	48 (43-58)	42.5 (37.75-55)	43 (37-55)	43 (39-50.5)	40 (37.5-49)
p**	.314	.866	<.001	.019	<.001	.007	.001	.008	.065
Weight (kg) (n=286)									
- (median with 25.-75. percentile)	75 (65-87)	76 (65-88)	75 (66-87.25)	75 (65-87)	75 (65.5-87)	75 (65.25-87)	75 (64.5-87)	75 (65-86.75)	75 (65-86)
+ (median with 25.-75. percentile)	71 (63-87)	68 (63.5-73)	64.5 (56.5-70)	70 (65-83.5)	70 (59-81)	70 (60-86)	74 (66-86.5)	69 (65.00-87.75)	73 (63.5-90)
p**	.400	.013	.001	.241	.031	.201	.766	.594	.708
Height (cm) (n=286)									
- (median with 25.-75. percentile)	174 (167-180)	173 (167-180)	172 (167-180)	172 (166.5-180)	172 (167-180)	172 (167-180)	172 (166.5-180)	172 (167-180)	172 (167-180)
+ (median with 25.-75. percentile)	170 (165-178)	165 (161-170)	170 (160-180)	170 (167.5-180)	170 (161-180)	172 (164.5-180)	172 (167-180)	170 (162.25-177.25)	172 (165.5-180)
p**	.036	<.001	.465	.803	.758	.984	.334	.272	.988
Surgical experience (years) (n=286)									
- (median with 25.-75. percentile)	10 (6-15)	10 (5.5-15)	10 (5-14.5)	10 (5-15)	9 (5-13)	10 (5-14.75)	10 (5-13.5)	10 (5-15)	10 (5-15)
+ (median with 25.-75. percentile)	10 (5-16)	9 (5-20)	20 (11.25-30)	12 (7-26)	20 (15-30)	12 (8.75-25)	13 (6.5-26)	14 (11-25)	13 (9-21.5)
p**	.518	.622	<.001	.009	<.001	.005	.001	<.001	.005

Table 3. Factors compared with pain regions (2 regions at least)

		pain more than two zone		
		None (n %**)	Exists (n %**)	p value*
Sex (n=266)	Female	24 (19.7)	98 (80.3)	.001
	Male	55 (38.2)	89 (61.8)	
Dominant hand (n=266)	Right	77 (31.3)	169 (68.7)	.045
	Left	2 (10.0)	18 (90.0)	
Smoking (n=266)	No	22 (27.8)	57 (72.2)	.668
	Yes	57 (30.5)	130 (69.5)	
Exercise (n=266)	No	47 (33.3)	94 (66.7)	.168
	Yes	32 (25.6)	93 (74.4)	
Surgery frequency (n=266)	Open	51 (29.7)	121 (70.3)	.839
	Laparoscopic	20 (31.7)	43 (68.3)	
	Equal	8 (25.8)	23 (74.2)	
Surgery pathology (n=266)	More benign	62 (30.0)	145 (70.0)	.979
	More malign	12 (29.3)	29 (70.7)	
	Equal	5 (27.8)	13 (72.2)	
Patient body mass index (n=266)	Normal	6 (35.3)	11 (64.7)	.827
	Overweight	39 (30.2)	90 (69.8)	
	Obese	34 (28.3)	86 (71.7)	
Ergonomics education (n=253)	No	51 (28.2)	130 (71.8)	.305
	Yes	25 (34.7)	47 (65.3)	
		(n) Median (25.-75. percentile)	(n) Median (25.-75. percentile)	
Age		n=79 40 (35-45)	n=187 39 (35-45)	.842
Surgical glove size		n=79 7.5 (7-7.5)	n=187 7 (6.5-7.5)	<.001
Exercise hours		n=46 4 (2-5)	n=95 2 (2-3)	.001
Sleep hours		n=79 7 (6-7)	n=187 6 (6-7)	.292
Surgical experience years		n=79 10 (5-15)	n=187 10 (5-15)	.695
Surgery count per year		n=79 100 (50-240)	n=187 100 (60-200)	.423
Surgeon Body mass index		n=79 26.12 (24.11-28.08)	n=187 25.35 (22.23-27.47)	.034

surgical instruments are typically designed for the larger male hand (13). The female sex, however, continued to be a risk factor even after these were adjusted. It could be because our culture has given female physicians in the family more responsibility, which makes them feel more stressed out. Or it's possible that male surgeons were unaware of their complaints or unwilling to acknowledge they had physical complaints.

Left-handedness was discovered to be a risk factor in the current study. Individuals who are left-handed confront difficulties with surgical training, equipment, and operating room efficiency. Lee et al. (16) assert that the training environment is less appropriate for left-handed trainees and not conducive to the development of proficient surgical skills. However, according to a recent study of orthopedists, left-handed surgeons have a larger percentage of ambidexterity and ambidexterity was found to be more advantageous in the operating room (17). It is possible that the influence of hand dominance on ergonomics and surgical skills varies by subspecialty; therefore, additional research is required.

Limitation

One of the study's strengths is its altered population. Capturing a variety of ergonomic experiences was enabled by the inclusion of multiple devices. The detailed questions regarding working conditions, pain regions, pain treatment methods, sick

Table 4. Risk Factor Analysis of Musculoskeletal Pain					
Factors included in test (Enter Method) 1. Sex (male-female) 2. Dominant hand (right/left) 3. Exercise hours per week 4. Surgeon's BMI 5. Surgical glove size	Singe Regions	Factors	p value	Exp (B)	95% CI
	Neck	None significant			
	Shoulder	None significant			
	Upper back	Female	.013	3.546	1.304-9.645
		Exercise hours per week (protective-reversed exp (B))	.045	1.198	1.005-1.355
	Elbow	Left dominant	.001	11.360	2.721-47.422
	Hand-fingers	None significant			
	Thumb	None significant			
	Wrist	Left dominant	.017	4.542	1.310-15.742
	Lower Back	None significant			
	Hip	Left dominant	.013	5.721	1.441-22.706
		Surgeon BMI (protective-reversed exp (B))	.045	1.155	1.004-1.283
	Knee	None significant			
	Feet	None significant			
	Multiple Regions				
	At least two regions	Female	.020	3.847	1.241-11.928
		Left dominant	.027	6.786	1.246-36.967
		Surgeon BMI	.643	1.033	.901-1.183
		Surgical glove size	.479	.695	.257-1.892
		Exercise hours (protective-reversed exp (B))	.007	1.286	1.088-1.441

leave, the effects of pain on the surgeon's life, the ergonomics of the operating room, and the surgeon's lifestyle are an additional strength of the study. The limitations of the study include a limited sample size, nonresponse, and the inherent self-selection bias of survey-based study designs. We lacked the use of objective measurements like electromyography. This study also does not address whether ergonomic interventions have reduced any of the reported complaints.

Conclusion

The objective of the study was to determine the prevalence and predictive factors of WRMSD in gynecologists. More than half of the gynecologists experienced WRMSD severe enough to effect familial, professional and social life, which was the most striking finding of the analysis.

In conclusion, female surgeon sex and left-handed dominance are related with significantly elevated risks of physical pain when doing surgery. It should be emphasized that exercise is linked to a protective component.

WRMSD are potentially affecting the surgeon's quality of life, income and professional life. Future research can be conducted to increase awreness and prevention from WRMSD among gynecologists.

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Availability of Data and Materials: The Data and materials are available from the corresponding author upon reasonable request and are subject to ethical review.

Authors' Contributions

HT: design of the work; acquisition, analysis, and interpretation of data; drafting and substantial review of the manuscript, review of the manuscript

SAT, design of the work; acquisition, analysis, and interpretation of data, review of the manuscript

AV: acquisition, analysis, and interpretation of data; drafting and substantial review of the manuscript, review of the manuscript

MGG: design of the work; acquisition and interpretation of data; drafting and substantial review of the manuscript; review of the manuscript

NÇ: design of the work; drafting and substantial review of the manuscript; review of the manuscript

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