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ASSOCIATED HEALTH PROBLEMS WITH PROLONGED STANDING AMONG OPERATING ROOM STAFF IN TERTIARY CARE HOSPITAL PESHAWAR

Syed Muhammad Salman[1], Muhammad Hilal[1], Mohib Ur Rahman[1], Tariq Jamil[2], Ihsan Ullah[3], Idress Ahmad[4], Muhammad Atif Alam[5]

[1]Lecturer, RMI Peshawar, Email: syedsalmankhan9398@gmail.com
[1]Trainee Surgical Technologist, RMI, Email: muhammadhilalkhan29@gmail.com
[1] Trainee Surgical Technologist, RMI Peshawar, Email: mohib.scrubtech@gmail.com
[2] Lecturer, RMI Peshawar, Email: tariq.jamil1@rmi.edu.pk
[3]Trainee Surgical Technologist, RMI Peshawar, Email: ihsansurgicaltech@gmail.com
[4] Lecturer, Ibadat International University Islamabad, Email: ahmadidress38@gmail.com
[5] Lecturer, RMI Peshawar, Email: atifalam254@gmail.com

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Corresponding Author:
Syed Muhammad Salman
Lecturer, RMI Peshawar.
Email: syedsalmankhan9398@gmail.com

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ABSTRACT

Background: Operating room (OR) environments are physically demanding, particularly for the healthcare professionals who spend long hours standing during surgeries. Surgeons, nurses, and technicians often endure discomfort, and over time, this prolonged standing can lead to significant health problems like musculoskeletal disorders (MSDs), back pain, and leg fatigue. Despite the common occurrence of these issues, there is limited support or intervention from employers to address the physical strain. This study explores how prolonged standing impacts the health of operating room staff, the symptoms they experience, the available treatment options, and the role of employer-provided interventions.

Methods: After Rehman College of Allied Health Sciences (RCAHS) ethical research committee approval a Descriptive Cross-Sectional Study was conducted. A total of 112 OT staff were included in the study. Data was collected through a questionnaire and analysed using SPSS version 20.0.

Objectives: (I) To identify the risk of Prolonged standing during surgical procedures on health and work performance of the OR staff. (II) To assess the knowledge for enhancing working conditions and minimizing health risks associated with Prolonged standing.

Results: Many operating rooms staff experience significant discomfort from prolonged standing. About 60.7% spend over 75% of their shift on their feet. Common symptoms include extreme fatigue (48.2%), back pain (43.8%), and leg pain (35.7%). Only 23.4% received interventions like therapy or medication. Most (65.2%) reported no employer support to reduce the prolonged standing effects. Despite this, 56.3% believed addressing prolonged standing would boost job satisfaction and performance. Additionally, 59.8% felt their health concerns were ignored by management.

Conclusion: The findings highlight the significant health impacts of prolonged standing on operating room staff, including fatigue and discomfort. Most staff feel unsupported by employers, reflecting a gap in workplace wellness practices. Addressing these concerns could enhance job satisfaction and performance. Simple, effective solutions are essential to alleviate physical strain.

INTRODUCTION

Standing for prolong periods of time has been linked to a number of significant health issues, including leg pain, menaces to the heart and the female reproductive system, discomfort, and exhaustion. When doing procedures, doctors, nurses & surgical staff members must stand for extended periods of time **[1].** Static contraction, which happens when workers work for prolong periods of time in standing posture, especially when upper body weight is transferred to lower body, causing lower back pain **[2].** In Saudi Arabia, LBP is very commonamong healthcare professionals. LBP is the most frequent cause of injury among healthcare personnel. Nurses were more likely to be exposed to LBP in work-related groups **[3].** It has been proposed that prolonged standing or walking at work leads to Varicose Veins **[4].** Because their line of work necessitates extended periods of standing by patients' bedsides, healthcare personnel are prone to acquire varicose veins than the general population [4]. Musculoskeletal problems can include pain, redness, swelling, numbness, tingling, cramping, weakness, and stiffness, as well as functional impairment **[5].** Research examining the connection between back pain and sagittal plane standing posture has revealed that deviating from the neutral position elevates the possibility of low back discomfort **[6].** An extended period of standing for a long time contributes to the development of leg vascular insufficiency **[7].**

Guidelines for preventing the adverse health effects of prolonged standing at work have also been released by the International Labor Organization (ILO) (2011). The ILO states that if a worker must do a task while standing, a chair or stool should be supplied, and the worker should be able to take regular breaks to sit down **[8].** It is reasonable that pro longed standing is more likely to cause leg swelling than sitting because of high hydrostatic pressure. This theory has been supported by studies on motionless standing and sitting **[8].**

The practice of prolonged standing or sitting for extended periods has become a common characteristic in many workplace environments. This type of work style is particularly prevalent in offices and other professional settings, where individuals are often required to remain in one position for hours. It is well-documented that maintaining such postures for extended periods can lead to a variety of health issues, including swelling of the legs, persistent pain, varicose veins, and the development of skin ulcers. These conditions are largely due to inadequate circulation of blood and lymph throughout the body, which is hindered by the lack of movement. The resultant poor blood flow and lymphatic drainage can significantly impact an individual's overall health and well-being **[9].**

In a 2-year prospective study conducted by Andersen and colleagues (2007) involving Danish workers from 30 different industries, it was found that prolonged periods of occupational standing (defined as standing for more than 30 minutes in each hour) was one of the most significant predictors of low back pain (LBP). The study reported a hazard ratio of 2.1 (95% CI 1.3–3.3), indicating a more than twofold increased risk of developing LBP associated with extended standing periods.

Similarly, a study among Dutch workers revealed a strong correlation between prolonged standing and an increase in pain complaints, particularly in the low back and thoracic regions. These findings highlight the detrimental effects of prolonged standing on musculoskeletal health, particularly in relation to spinal pain **[10].** When individuals maintain standing postures for extended periods, many muscles, particularly those in the back, are subjected to continuous tension. In these muscles, the intramuscular pressure can exceed the blood pressure, preventing adequate blood circulation while the muscles remain contracted and active. As a result, these muscles do not receive sufficient oxygen and nutrients, leading to the accumulation of metabolic byproducts like lactic acid. This

process causes muscle fatigue and discomfort, which can develop within minutes of maintaining such a posture. However, these effects can be mitigated if the individual changes or interrupts their static posture regularly.

If prolonged periods of standing become a habitual practice, the muscles may experience long term detrimental effects, including irreversible changes to muscle tissue. Over time, individuals may experience a decreased tolerance for pain and fatigue, as the muscles become less resilient. In addition to the muscles, prolonged standing can also impact the joints. The knee and hip cartilage, which bear the load during standing, may suffer from continuous compression in localized areas, disrupting the blood supply to the cartilage and leading to wear and tear. Maintaining static postures for extended periods also results in the expulsion of synovial fluid from the joints. This fluid is essential for lubricating joint surfaces, and when one resumes movement, the joints experience temporary reduced lubrication, increasing the likelihood of joint degradation and wear **[11].**

When individuals are required to maintain an upright posture without periodic walking or movement, the circulation of blood and other bodily fluids is compromised. This leads to the pooling of fluids in the lower legs and feet, causing swelling that can progress to more serious conditions, such as inflammation of the veins and varicose veins. The most common and immediate symptoms of prolonged standing are discomfort and fatigue, typically felt in the feet, legs (e.g., shins, calves, knees, and thighs), and lower back. However, pain and discomfort can also extend to the hips, neck, and spine. A study on occupational risks within the nursing profession, particularly regarding preterm birth, found that nurses who stood for extended periods—ranging from four to six hours or more than six hours per shift—faced a significantly increased risk of premature birth. This highlights the broader health risks associated with prolonged standing in healthcare environments **[10].**

A recent systematic review on epidemiological evidence, though based on limited high-quality data from longitudinal studies, found that occupational standing was negatively associated with the occurrence of low back symptoms. While the evidence regarding the link between excessive standing and symptoms in the lower extremities remained inconclusive, the limited data on upper extremity symptoms did not indicate any significant association. Previous research has proposed several mechanisms that may contribute to standing-related low back pain, including muscle fatigue, prolonged static postures, and the lack of variation in movement. These factors are believed to play a role in the development of discomfort and symptoms associated with extended standing in the workplace **[12].**

Musculoskeletal discomfort is often believed to arise from inflammation caused by the pooling of blood in the lower limbs, which results from reduced circulation and venous return, compounded by gravity-assisted blood backflow. Additionally, static muscle contraction induced by prolonged standing can lead to muscle fatigue and discomfort, potentially triggering the development of musculoskeletal disorders (MSDs). Madeleine and colleagues suggested that when muscles are under load for extended periods, metabolic byproducts accumulate, causing the muscles to become hypersensitive, which further increases the risk of MSDs.

Furthermore, the lack of joint movement and continuous tissue compression during prolonged standing can contribute to cartilage degeneration, increasing the likelihood of developing rheumatic diseases over time. These factors highlight the importance of addressing the ergonomic risks associated with prolonged standing to prevent long-term musculoskeletal and joint issues **[13].** Prolonged standing without the opportunity to sit has been linked to musculoskeletal symptoms, particularly in

the lower legs and back. Extended periods of standing can place significant strain on the muscles and joints in these areas, leading to discomfort, fatigue, and pain. The lack of movement and the continuous load on the lower limbs and spine contribute to the development of these symptoms, which can escalate over time if the standing posture is maintained without relief **[14].**

METHODOLOGY

Our study design was Descriptive Cross Sectional. The study population was Operating Room Staff. The study was conducted in various operating rooms at Rehman Medical Institute (RMI), Hayatabad, Peshawar, including the General O.T, Cardiac O.T, Gynae O.T, and Minor O.T The duration of the study was 3-4 months for this Cross-sectional study. Taking a population of approximately 157 total O.T staff and applying the formula: n = [DEFF*Np(1-p)]/[(d2/Z21-α/2*(N-1) +p*(1-p)], OpenEpi calculated the sample size with a 95% confidence level and a 5% margin of error. The determined sample size was 112. Non-Probability Convenient sampling technique was used for this study. All cooperative Operating Room staff were included in the study. Those who had prolonged standing for approximately 4 hours a day, such as Surgeons, Scrub Nurses, Surgical Technicians, and Technologists, were included. Operating Room staff who had no illnesses that could have led to back pain, musculoskeletal disorders, or circulatory disorders were included. Operating Room staff who had undergone spinal surgery for musculoskeletal disorders were excluded. Those who refused to consent to participate in the study were also excluded.

The study proceeded following clearance from the institutional research ethical committee and signed permission from each OR department head, after supervisor consultation and approval. Data analysis was done using SPSS v20.0. Frequency tables, charts, and graphs were used to present the data. The data was collected through a self-administered questionnaire.

RESULTS

In total 112 participants, 81(72.3%) were male and 31(27.7 %) were female. Our results showed that 70 participants (62.5%) are between 20 and 27 years old, 22 (19.6%) are between 28 and 35 years, 12 (10.7%) are between 36 and 43 years, 5 (4.5%) are between 44 and 51 years, and 3 participants (2.7%) are between 52 and 60 years old. Among them, 48 (42.9%) are married, while 64 (57.1%) are unmarried.

The professional roles of the 112 staff participants. Among them, 22 (19.6%) are surgeons, 11 (9.8%) are TMOs, 3 (2.7%) are anaesthesiologists, 33 (29.5%) are surgical technologists, 15 (13.4%) are surgical technicians, 7 (6.3%) are nurses, 10 (8.9%) are anaesthesia technologists, 4 (3.6%) are anaesthesia technicians, 4 (3.6%) are perfusionists, and 3 (2.7%) is a radiology technologist.

Table.1. representing important variables and the corresponding answers.

Variable Name		
Working in the Hospital	**Frequency**	**Percent**
Less than 1 year	27	24.1
1 to 3 years	40	35.7
4 to 6 years	16	14.3
more than 6 years	29	25.9
Total	112	100
Working Hours Per Week		
Less than 40 hours	16	14.3
40 to 49 hours	60	53.6
50 to 59 hours	25	22.3
60 hours or more	11	9.8
Total	112	100
Hours of Standing Per shift		
Less than 2 hours	9	8.0
2 to 4 hours	24	21.4
4 to 6 hours	40	35.7
6 to 8 hours	39	34.8
Total	112	100
Scheduled Breaks		
Every hour	7	6.3
Every 2 to 3 hours	25	22.3
Every 4 to 5 hours	34	30.4
Rarely or never	46	41.1
Total	112	100
Surgical Departments of Participants		
General surgery	22	19.6

Orthopaedic surgery	12	10.7
Cardiac surgery	23	20.5
Neurosurgery	14	12.5
Urological surgery	12	10.7
Obs and gynae surgery	25	22.3
Minor OT	4	3.6
Total	112	100

Table.1. Representing important variables and the corresponding answers.

Symptoms/Risks	YES/NO	Frequency	Percentage
Persistent Pain or Discomfort	YES	53	47.3
	NO	59	52.7
Swelling in legs or feet	YES	17	15.2
	NO	95	84.8
Difficulty in mobility or balance	YES	20	17.9
	NO	92	82.1
Extreme fatigue	YES	54	48.2
	NO	58	51.8
Back pain	YES	49	43.8
	NO	63	56.3
Leg pain	YES	40	35.7
	NO	72	64.3
Foot pain	YES	26	23.2
	NO	86	76.8
Varicose vein	YES	3	2.7
	NO	109	97.3
Cramps	YES	17	15.2
	NO	95	84.8
sculoskeletal disorders	YES	19	17.0
	NO	93	83.0
	Total	**112**	**100.0**

Table.2. Presents the frequency of symptoms/Risks reported by operating theater staff due to prolonged standing during surgical procedures

Table.3. Shows the impact of prolonged standing during surgical procedures on participants' overall health. Among the participants, 31 (27.7%) reported no impact, 47 (42.0%) reported a minor impact, 25 (22.3%) reported a moderate impact, and 9 (8.0%) reported a major impact.

Impact of Prolong Standing on Overall Health	Frequency	Percentage	Valid Percentage
No impact	31	27.7	**27.7**
Minor impact	47	42.0	**42.0**
Moderate impact	25	22.3	**22.3**
Major impact	9	8.0	**8.0**
Total	**112**	**100.0**	**100.0**

Table.3.

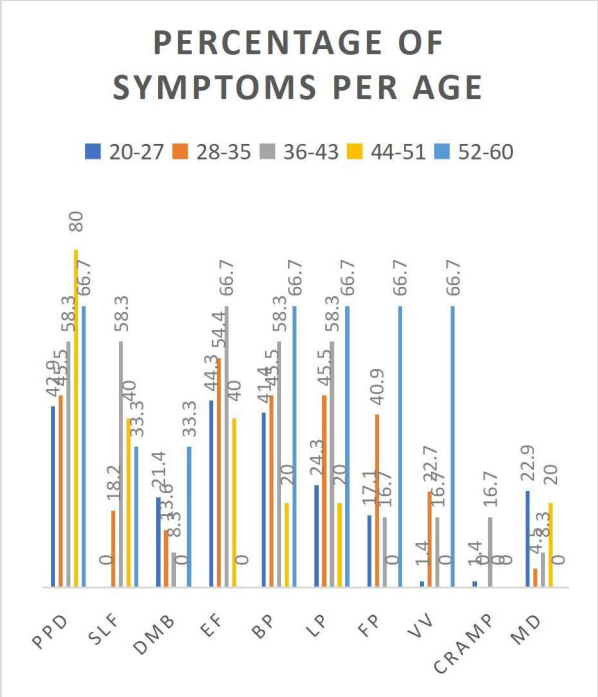

Figure.1. PPD (Persistent Pain and Discomfort), SLF (Swelling in Legs or feet), DMB (difficulty, immobility or balance), EF (Extreme Fatigue), BP (Back Pain), LP (Leg Pain), FP (Foot Pain), VV (Varicose veins), MD (Musculoskeletal Disorder)

The chart presents the percentage of symptoms caused by prolonged standing among different age groups. In the 20–27 years group, Persistent Pain or Discomfort (PPD) was reported by 42.9%, Extreme

Fatigue (EF) by 44.3%, Back Pain (BP) by 41.4%, and Leg Pain (LP) by 24.3%, with lower occurrences of Difficulty in Mobility or Balance (DMB) (21.4%), Foot Pain (FP) (17.1%), Varicose Veins (VV) (1.4%), Cramps (1.4%), and Musculoskeletal Disorders (MD) (22.9%). Among the 28–35 years group, PPD increased to 45.5%, EF to 54.4%, and BP and LP to 45.5%, while Swelling in Legs or Feet (SLF) rose to 18.2%, FP to 40.9%, and VV to 22.7%, with minimal reports of DMB (13.6%) and MD (4.5%). In the 36–43 years group, PPD climbed to 58.3%, EF to 66.7%, and BP, LP, and SLF all to 58.3%, with moderate occurrences of FP, VV, and Cramps (16.7% each), and lower reports of DMB (8.3%) and MD (8.3%). The 44–51 years group reported the highest PPD (80%) and SLF (40%), while EF dropped to 40%, and BP, LP, and MD each stood at 20%, with no reports of FP, DMB, VV, or Cramps. The 52–60 years group showed high rates of BP, LP, FP, VV, and PPD (66.7% each), while SLF and DMB were 33.3%, with no reports of Cramps or MD.

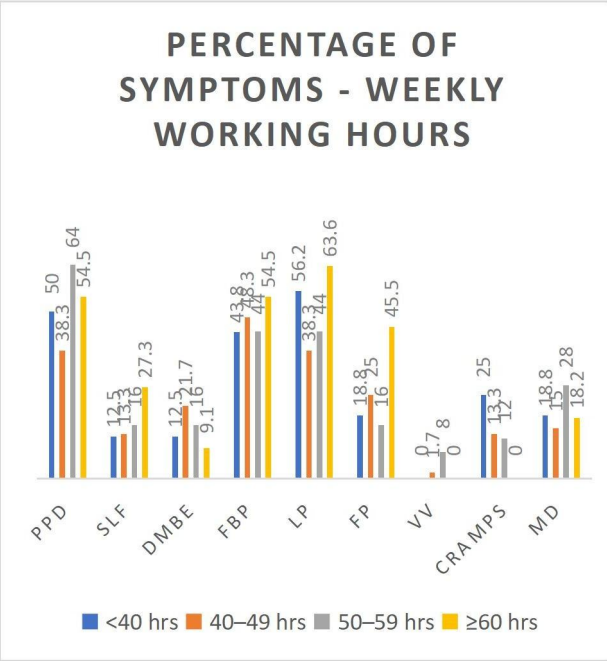

Figure.2. PPD (Persistent Pain and Discomfort), SLF (Swelling in Legs or foots), DMB (difficulty immobility or balance), EF (Extreme Fatigue), BP (Back Pain), LP (Leg Pain), FP (Foot Pain), VV (Varicose veins), MD (Musculoskeletal Disorder)

Figure.2. illustrates the percentage of symptoms caused by prolonged standing across different working hour categories. In the <40 hours category, Persistent Pain and Discomfort (PPD) was reported by 50%, Extreme Fatigue (EF) by 50%, Swelling in Legs or Feet (SLF) by 12.5%, Difficulty with Immobility or Balance (DMB) by 12.5%, Back Pain (BP) by 56.2%, Leg Pain (LP) by 43.6%, and Foot Pain (FP) by 18.8%, with minimal occurrences of Varicose Veins (VV) (0%) and Cramps (0%). Among the 40-49 hours category, PPD increased to 38.3%, EF to 48.3%, and SLF to 13.3%, while Back Pain (BP) and Leg Pain (LP) rose to 38.3% and 25%, respectively. In the 50-59 hours category, PPD remained at 64%, while EF stood at 44%, with a notable rise in SLF (16%) and Back Pain (BP) (52%). The 60+ hours category experienced the highest prevalence of PPD (54.5%), BP (54.5%), and EF
(54.5%), with Leg Pain (LP) at 63.6% and SLF at 27.3%.

DISCUSSION

The purpose of the study was to determine the frequency of health risks among operating room personnel and how they relate to prolonged standing time during surgery. We gathered information for this purpose from 112 staff working in different operating rooms at RMI.

In our current study, the majority of participants (62.5%) were aged 20–27 years, followed by decreasing representation in older age groups: 28–35 years (19.6%), 36–43 years (10.7%), 44–51 years (4.5%), and 52–60 years (2.7%). This younger demographic aligns with workforce trends in healthcare, where younger staff often dominate operational roles. Male participants (72.3%) outnumbered females (27.7%), consistent with the male-dominated nature of surgical environments in similar studies. The younger workforce and male predominance suggest a potential focus area

for tailored ergonomic solutions and interventions targeting these groups to reduce the onset of musculoskeletal issues **[1].**

According to our survey, Surgical technologists constituted the largest group (29.5%), followed by surgeons (19.6%), surgical technicians (13.4%), anesthesia technologists (8.9%), and nurses (6.3%). The distribution reflects the critical roles of these positions in operating room functional system, with higher symptom rates observed in roles requiring prolonged static postures, such as nursing and anesthesia. Among participants, 64 (57.1%) were unmarried, while 48 (42.9%) were married, suggesting that workplace-related stress and health risks are common regardless of marital status. Addressing the ergonomic needs of specific roles may reduce these health impacts and improve overall job satisfaction.

The study included staff from various surgical departments, with Gynecology (22.3%), Cardiac Surgery (20.5%), and General Surgery (19.6%) representing the largest groups. Participants from departments with intensive procedural demands, such as Gynecology, reported higher fatigue and discomfort. Additionally, 35.7% of participants had 1–3 years of experience, while 25.9% had more than six years. Those with longer durations reported more severe symptoms, indicating cumulative exposure to prolonged standing as a significant risk factor. These findings align with Coenen et al. (2017), who identified long-term exposure as an indicator of musculoskeletal strain **[12].**

Furthermore, most participants (53.6%) worked 40–49 hours weekly, with 22.3% working 50–59 hours and 9.8% exceeding 60 hours per week. Longer working hours were associated with higher frequency of symptoms, including extreme fatigue (48.2%), back pain (43.8%), and leg pain (35.7%). Additionally, 34.8% of participants stood for 6–8 hours per shift, and 35.7% stood for 4– 6 hours. These conditions emphasize the need for interventions targeting extended standing durations to mitigate health risks, as noted by Hanif and Murad (2020) **[1].**

In our current study, a significant proportion of participants (41.1%) reported rarely or never having scheduled breaks, while only 6.3% had breaks every hour. Furthermore, 60.7% of participants spent over 75% of their shifts standing, while 27.7% alternated equally between standing and sitting. Prolonged static postures without regular breaks worsen discomfort and fatigue, as emphasized by Halim and Omar (2012) [2]. Implementing frequent breaks, as recommended by international guidelines, could significantly reduce musculoskeletal strain and enhance workplace ergonomics **[11].**

According to our study, extreme fatigue (48.2%), back pain (43.8%), and leg pain (35.7%) were the most commonly reported symptoms. However, 76.8% of participants reported receiving no treatment, reflecting a gap in healthcare support. Among those who received treatment, physical therapy (13.4%) was the most common, followed by medication (6.3%) and rest or modified duties (2.7%). The lack of comprehensive treatment options highlights the need for improved access to healthcare interventions for operating room staff.

According to our research data ergonomic facilities were minimally provided, with only 12.5% of participants reporting access to supportive footwear, 5.4% to anti-fatigue mats, and 8.9% to regular breaks. Participants who received interventions rated them as somewhat effective (56.4%) or very effective (33.3%). These findings underscore the need for better ergonomic practices, as noted by Waters and Dick (2015), who demonstrated the effectiveness of ergonomic tools in reducing workplace discomfort **[8].**

According to the data in our research most participants (42%) reported a minor impact of prolonged standing on their health, while 22.3% described it as moderate and 8% as

major. Despite these impacts, 59.8% felt their health concerns were unacknowledged by management. Addressing these concerns through proactive workplace policies could enhance job satisfaction, as supported by Hughes et al. (2011) **[10].**

Furthermore, Younger staff (20–27 years) reported symptoms such as back pain (41.4%) and fatigue (44.3%) nearly as frequently as older groups, suggesting an early onset of musculoskeletal issues. Weekly working hours exceeding 60 correlated with the highest symptom rates, including persistent pain (54.5%) and fatigue (54.5%). Radiology technologists and anesthesia technicians reported extreme fatigue (66.7%) and musculoskeletal disorders (33.3%) due to static postures, emphasizing the role of job-specific demands in health risks **[15][16].**

CONCLUSION

This study achieved its objective of identifying the health risks associated with prolonged standing among operating room staff. The results revealed a high prevalence of musculoskeletal symptoms, including back pain (43.8%), extreme fatigue (48.2%), persistent discomfort (33%), and leg pain (35.7%), alongside other symptoms such as swelling (15.2%) and difficulty in mobility or balance (17.9%). Additionally, the lack of ergonomic interventions and insufficient acknowledgment of these risks by employers highlighted significant gaps in workplace practices. These findings emphasize the urgent need for improvements in workplace ergonomics and interventions to mitigate these health risks. By providing a detailed understanding of the problem, this study contributes valuable insights for future research and practical solutions aimed at improving the health and well-being of OR staff.

Hospitals should invest in ergonomic solutions, such as anti-fatigue mats, supportive footwear, and adjustable workstations to reduce the physical burden of prolonged standing. Implementing regular break times where staff can sit or move around during long procedures would significantly reduce fatigue and physical discomfort. Offering regular physical check-ups, physical therapy, and resources for pain management would help prevent long-term musculoskeletal issues. O.T management should listen to and acknowledge the health concerns of their staff, engaging in open discussions about how to improve working conditions and showing a genuine commitment to staff well-being.

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