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Prevalence of Musculoskeletal Disorders Among Healthcare Workers at Colonel Lotfi Hospital in 2026

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Dedication

First and foremost, Praise be to Almighty ALLAH,

Who has enabled me to reach this long-awaited day. الحمدلله والشكر لله

I dedicate this thesis…

To my parents

This thesis is the culmination of your unconditional efforts in my education and training. I will never be able to repay even the smallest part of your immense sacrifices for me, throughout all the days and nights that were sometimes so difficult. There is not a single word in any language that could express the love, affection, and admiration I have for you. You are my constant source of strength and faith. May God protect you for me and grant you a long life

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To all my teachers who have helped me learn and grow

To everyone who has helped me And brought good into my life Even if it was just a smile

Ilyes

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Youcef

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Abbreviations List

MSD: *Musculoskeletal Disorder*

WMSDs :*Work-Related Musculoskeletal Disorders*

MSD-UL *: Musculoskeletal disorders of the upper limb*

HCW :*Healthcare workers*

CUTs: *Cubital Tunnel Syndrome*

EPH : *Public Hospital Establishment*

BMI :*Body index mass*

CTS : *Carpal Tunnel Syndrome*

RTS :*Radial Tunnel Syndrome*

OA: *Osteoarthritis*

DIP : *Distal Interphalangeal Joint*

PIP : *Proximal Interphalangeal Joint*

ACL : *Anterior Cruciate Ligament*

PCL : *Posterior Cruciate Ligament*

WHO :*World Health Organization*

MCL : *Medial Collateral Ligament*

INTRODUCTION

The human musculoskeletal system, also called the locomotor system, consists of muscles, bones, joints, and associated connective tissues, which provide structural support, enable movement, and protect vital organs. Proper functioning of this system is essential for health and occupational performance. Impairments can lead to pain, reduced mobility, and decreased quality of life, collectively referred to as musculoskeletal disorders (MSDs). (1)

Musculoskeletal conditions are common across all ages and socio-demographic groups and are a leading cause of chronic pain and long-term disability worldwide. They limit mobility, dexterity, and daily activities, affecting both personal well-being and productivity. Approximately one in four adults in Europe is affected, and prevalence increases with age and lifestyle factors such as obesity and physical inactivity. (2)

Healthcare professionals are particularly vulnerable to musculoskeletal disorders due to the physically demanding nature of their work. Tasks such as patient handling, prolonged standing, repetitive movements, and awkward postures place significant strain on the musculoskeletal system, especially the lower back, neck, shoulders, and upper limbs. Studies worldwide have reported high prevalence rates of MSDs among healthcare workers, ranging from 40% to 90%, depending on the job role and clinical setting. These disorders not only affect the health and well-being of staff but also contribute to absenteeism, reduced productivity, and compromised patient care, underscoring the need for targeted preventive strategies in hospital environments .(3)

Musculoskeletal problems affect parts of the body like the lower back, neck, shoulders and arms. These problems can cause pain, stiffness and limited movement. Can be acute or chronic. They happen when physical stress, individual factors and work-related exposures combine causing damage to tissues over time.

In hospitals musculoskeletal disorders vary depending on the job, tasks and how long someone has been working. Knowing the patterns how often they. The symptoms of these disorders in healthcare workers helps understand how big of a problem they are, in specific hospitals. This information gives insight into what healthcare workers face on the job and helps assess how musculoskeletal disorders affect their health and work.

In Algeria, MSDs are not yet recognized as a major occupational health concern. The country operates under a single general system for employees, with compensation for occupational diseases governed by 85 official tables, none of which specifically address MSDs. The true extent of MSDs among healthcare professionals is likely underestimated due to the lack of systematic data collection, limited reporting, and difficulties in tracing cases. (4)

In particular, there is no data on the prevalence and patterns of MSDs among healthcare professionals at the 240-bed mixed public hospital (EPH) of Laghouat. This gap highlights the need for research in this setting to provide evidence-based recommendations for preventive strategies and occupational health interventions.

These observations lead us to frame the research problem around the prevalence of musculoskeletal disorders in this hospital, as well as the associated sociodemographic factors. This raises the following research questions:

What is the prevalence of musculoskeletal disorders among healthcare professionals at the 240-bed EPH of Laghouat? And what are the sociodemographic characteristics associated with these disorders in this population?

LITERATURE REVIEW

1. Generalities

Musculoskeletal disorders encompass a broad spectrum of inflammatory and nerves, and associated vascular structures. They include well-defined clinical entities such as tendon disorders (e.g., tenosynovitis, epicondylitis, bursitis), nerve entrapment syndromes (including carpal tunnel syndrome and sciatica), and degenerative joint diseases like osteoarthritis. In addition, they also cover less clearly defined conditions, such as myalgia, low back pain, and various regional pain syndromes for which no specific underlying pathology can be identified. The anatomical regions most frequently affected are the lower back, neck, shoulder, forearm, and hand, although increasing attention has recently been directed toward disorders of the lower limbs. (5)

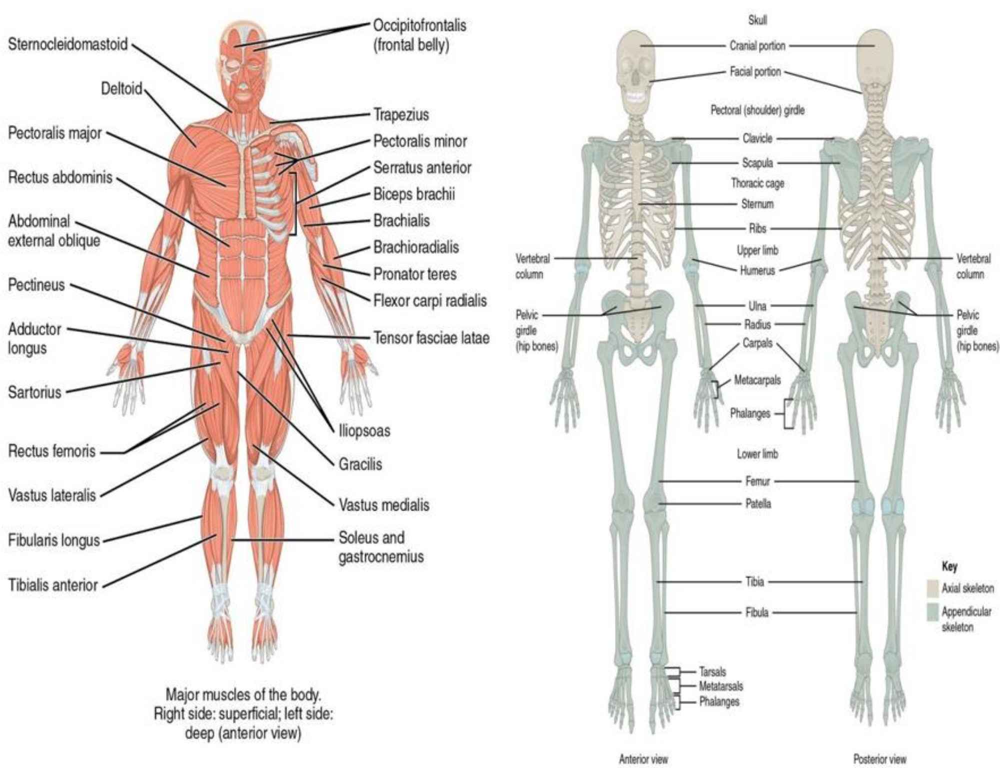

Figure 1: Overview of the human musculoskeletal system highlighting the anatomical structures (muscles, tendons, joints) susceptible to professional inflammatory and degenerative conditions.(6)

2. DEFENITION

Musculoskeletal Disorders (s) specifically refer to conditions where the work environment and the performance of work contribute significantly to the condition, or where the condition is worsened by work demands. These disorders affect a broad range of structures, including muscles, ligaments, tendons, bones, joints, spinal discs, nerves, and blood vessels. This definition excludes injuries caused by crushing, entrapment (such as fractures or dislocations), or cutting resulting from the mechanical operation of equipment. (7)

MSDs are typically characterized by pain and temporary or lifelong limitations in mobility and dexterity, which reduce people's ability to work and participate in social life. (8). These disorders are significant causes of workplace injury and can impair movement, function, and overall quality of life. (9)

MSDs are multifactorial disorders that arise from a combination of physical factors such as force, repetition, and posture, psychosocial or organizational factors, like high work intensity or low support. These main stressors, together with individual and environmental influences, gradually lead to the development of MSDs in the workplace. (10)

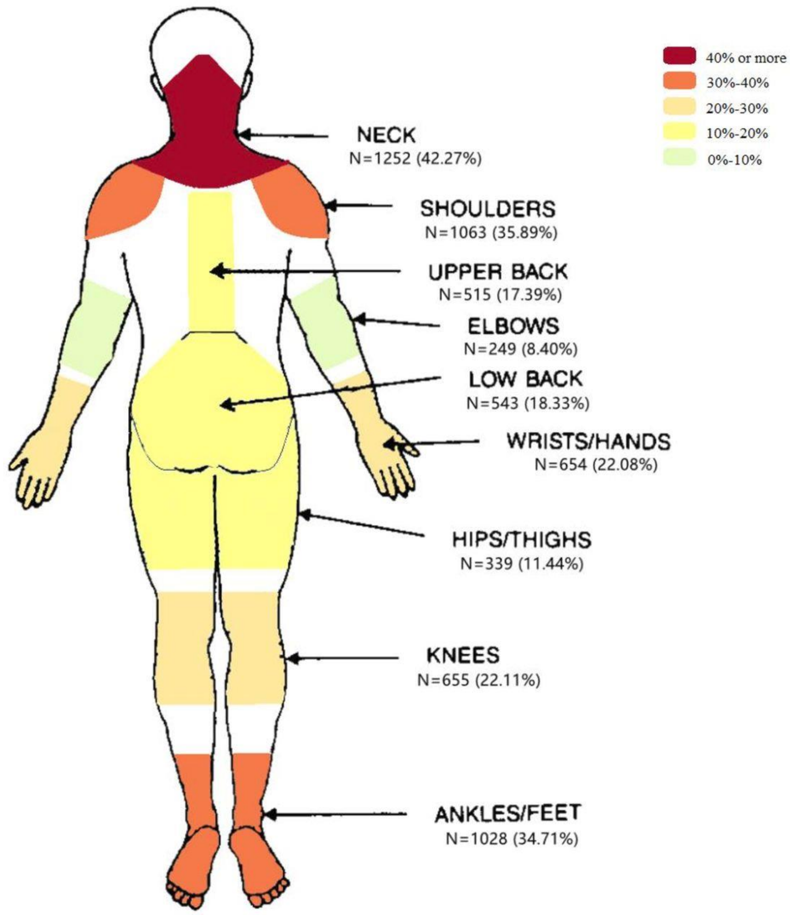

Figure 2: Prevalence of Musculoskeletal Disorders by Body Region.(11)

3. Pathophysiology

WMSDs develop gradually due to repeated trauma, manual handling and awkward postures that can cause cumulative disorders of the musculoskeletal system of health care workers in hospital(12) ,WMSDs mainly involve muscle, tendon, and nerve injuries.

Muscle injuries occur when prolonged contraction reduces blood flow, causing by-products like lactic acid to accumulate. This irritates the muscles and leads to pain, which depends on contraction duration and rest periods.

Tendon injuries are caused by repetitive or awkward movements. Tendons with sheaths, mainly in the hand and wrist, can develop friction and inflammation (tenosynovitis) if lubrication fails, sometimes forming ganglion cysts. Tendons without sheaths, around the shoulder, elbow, and forearm, can tear with repeated tension, causing thickening and inflammation (tendonitis). Friction against bursae may lead to bursitis.

Nerve injuries result from compression by swollen surrounding tissues during repetitive or strenuous actions, impairing nerve function**.**(13)

All three of these mechanisms, caused by overstretch, compression, friction, ischemia, and overexertion, initially trigger an inflammatory response. Under normal conditions, inflammation functions to repair or replace injured tissue with healthy, regenerated tissue. However, if repetitive tasks continue on already injured and inflamed tissues, a vicious cycle may develop, characterized by ongoing injury, chronic inflammation, fibrosis, and, in some cases, tissue breakdown. This process ultimately leads to loss of motor function and pain, which is not brief but persists beyond the period of movement, suggesting an ongoing inflammatory process, and reflects the typical clinical manifestations of WMSDs.(14)

4. Epidemiology

4.1. Global Prevalence and Burden

Musculoskeletal disorders (MSDs) are recognized as the leading cause of work-related illness among HCWs globally. According to a landmark systematic review, the prevalence of MSDs among nursing staff has been estimated to be approximately 33–88% (15) .These conditions are the primary contributor to years lived with disability (YLDs) worldwide, particularly affecting the working-age population in labor-intensive sectors like healthcare.(16)

4.2. Prevalence by Anatomical Region

4.2.1. Lower Back

This remains the most significant site of injury. Approximately 68.3% of healthcare workers, especially nurses, experience work-related low back pain, primarily due to manual patient lifting and awkward postures.(17)

4.2.2. Neck and Shoulders

These regions are increasingly affected, with prevalence rates ranging from 52% to 65%. This is often attributed to static overhead reaching and prolonged "head-down" postures during documentation and specialized procedures.(18)

4.2.3. Lower extremities (knees/feet)

Studies indicate that the prevalence of ankle–foot pain among nurses in surgical units is 51.8%. This high rate is strongly correlated with the specific physical and organizational demands of the perioperative environment, largely due to the cumulative strain of long shifts spent standing or walking.(19)

4.3. Demographic Distribution of WMSDs

The demographic profile of musculoskeletal disorders among healthcare staff suggests a complex relationship between age, physical characteristics, and professional longevity. Research indicates that the average nursing professional experiencing these symptoms is approximately 36.4 years of age, with a mean body mass index (BMI) of 26.2 kg/m², suggesting that increased body mass may compound mechanical stress on weight-bearing joints. While some studies report varying findings regarding gender as an independent risk factor, the cumulative impact of clinical experience remains a primary predictor of injury. Specifically, nurses with more than 20 years of clinical experience are nearly four times more likely to develop WMSDs compared to those with 11–20 years of experience.(20)

5. Classification

5.1. Upper limb MSD’s

In the literature, WRMSDs-UL are usually seen as complex syndromes rather than just simple diseases. This is an important distinction because the term "disorder" covers a huge variety of issues—affecting everything from tendons and muscles to blood vessels—where the person might feel a lot of pain or lose function even if an X-ray or scan doesn’t show obvious damage. And to make things clearer for doctors and researchers, the SALTSA (European experts specializing in occupational health) created a specific list of 12 conditions that are officially recognized in this category. Out of these twelve, 11 are "specific" while the last one is a "non-specific" category for general pain. Having this list of 12 helps us move away from vague descriptions and gives us a solid standard to follow when studying these injuries in the workplace(21)

Neck pain with referred pain
Rotator cuff syndrome
Medial and lateral epicondylitis
Ulnar nerve entrapment in the cubital tunnel
Radial nerve entrapment (radial tunnel syndrome)
Flexor and extensor tendinitis at the hand and fingers
De Quervain tenosynovitis
Carpal tunnel syndrome
Ulnar nerve entrapment in Guyon's tunnel
Raynaud's phenomenon or peripheral neuropathy related to vibrations of the hand and arm
Osteoarthritis of the elbow, wrist, and fingers
Nonspecific MSD-UL

Table 1: List of 12 WRMSD-UL developed by the European SALTSA panel(22)

5.1.1. Rotator cuff syndrome

The rotator cuff is a group of four muscles and tendons (the supraspinatus, infraspinatus, teres minor, and subscapularis) that work together to hold your shoulder joint in place.

When we talk about rotator cuff syndrome, we aren't referring to just one injury, but rather a whole range of issues. This includes everything from simple inflammation and bursitis to actual tears in the tendons, whether they are small partial frays or complete breaks. If these problems aren't managed and become chronic, they can eventually lead to more serious joint wear and tear, like arthritis in the shoulder(23)

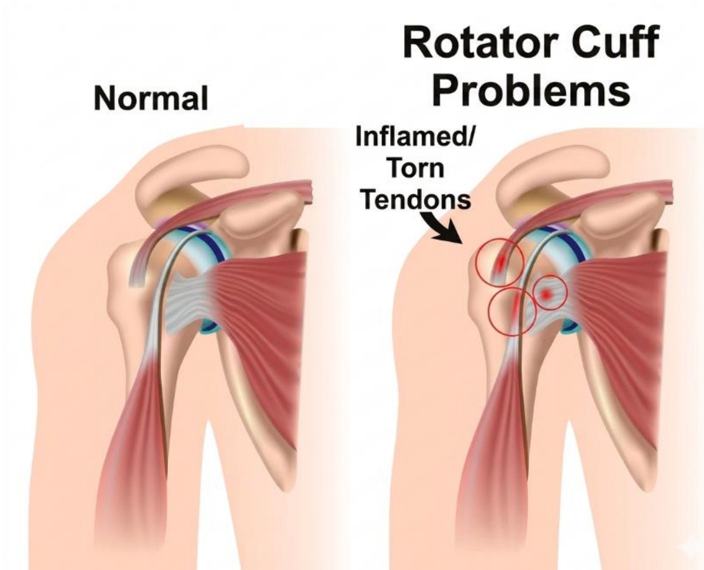

Figure 3: Illustration of Rotator Cuff Syndrome Showing Inflamed and Torn Tendons Compared to Normal Shoulder Structure(24)

Healthcare workers, particularly nurses and assistants, face a significant occupational hazard when it comes to shoulder disorders. Because their daily routines involve intense physical demands specifically the repeated lifting, repositioning, and transferring of patients these frontline staff members are much more vulnerable to injury than those in administrative roles. This risk is especially high for female staff and older employees, particularly those working in busy outpatient clinics or general hospital wards. Ultimately, the frequent occurrence of shoulder problems in these environments highlights a critical need for better ergonomic tools and safer patient-handling protocols to protect the long-term health of medical staff throughout their careers (25).

5.1.2. Epicondylitis

commonly known as **tennis elbow** (lateral) or **golfer's elbow** (medial), is a condition caused by repetitive micro-tears in the tendons where they attach to the elbow bone. Rather than a sudden injury, it is a **degenerative process** that occurs when the forearm muscles are overworked, leading to structural breakdown and sharp pain at the joint. While the names suggest sports, it is a frequent occupational hazard for healthcare workers due to constant gripping and lifting. Most cases are managed through a two-phase recovery: first "cooling" the area with rest and ice to stop inflammation, and then "rebuilding" the tendon through strengthening exercises and counterforce bracing to relieve pressure(26).

Lateral epicondylitis (LE) represents a moderate component of musculoskeletal disorders among healthcare workers, with a prevalence higher than in the general population but not as elevated as in some other occupational groups. Its occurrence is not clearly linked to specific healthcare job categories, likely due to the wide variability in physical demands and upper-limb loading across different roles. (27)

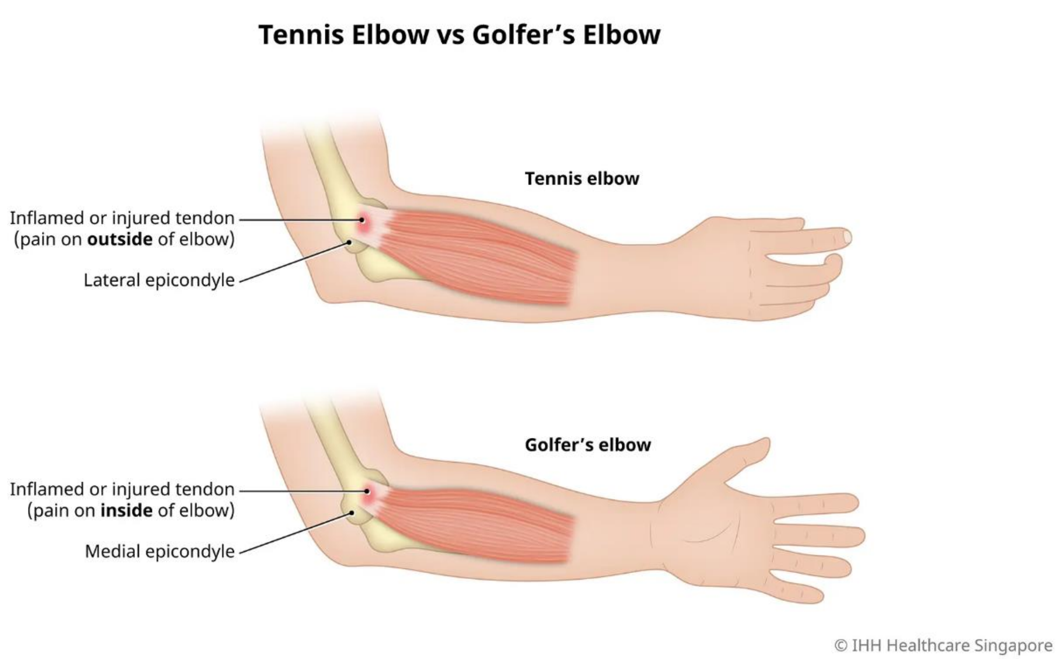

Figure 4: Comparison between Tennis Elbow and Golfer's Elbow showing affected tendons and epicondyles(28)

5.1.3. De Quervain’s disease

Also called stenosing tenosynovitis, is a painful condition caused by the restricted gliding of two specific tendons at the base of the thumb as they pass through a narrow fibro-osseous tunnel in the wrist. This pathology results from a mismatch between the size of the tendons and the space available within this canal, leading to sharp pain and functional impairment during activities that involve gripping, pinching, or twisting. Statistically more common in women, this condition is a frequent occupational hazard in healthcare settings, where the constant manual demands of patient care can trigger inflammation and a characteristic "sticking" or "snapping" sensation when moving the thumb. Ultimately, the disorder is defined by this mechanical friction, which limits the smooth mobility of the first dorsal compartment of the wrist (29).

Figure 5: Anatomical Illustration of De Quervain's Tenosynovitis Showing Tendon Entrapment, Sheath Involvement, and Localized Swelling(30)

De Quervain’s tenosynovitis is a significant cause of hand dysfunction among healthcare professionals, characterized by tendon entrapment in the first dorsal compartment of the wrist. This condition is strongly associated with repetitive manual activities, including frequent mobile device usage, which can lead to measurable functional disabilities in daily professional duties. Research indicates a high prevalence of this disorder within the medical community, with women being statistically more likely to be affected. The severity of the condition often correlates with the intensity of repetitive thumb movements, such as frequent texting, which results in symptoms like restricted movement and pain during resisted extension. To prevent the onset of such musculoskeletal disorders, it is essential for medical staff to adopt ergonomic habits, such as taking regular breaks, using both hands for manual tasks, and ensuring proper forearm support.(31)

5.1.4. Radial Tunnel Syndrome

RTS is a condition characterized by the dynamic compression of the radial nerve specifically its deep branch, the posterior interosseous nerve (PIN) as it traverses a narrow anatomical space in the proximal forearm known as the radial tunnel. While it is technically a compressive neuropathy, it is unique because it rarely presents with the typical numbness or muscle wasting seen in other nerve entrapments; instead, it manifests as a persistent, debilitating ache located over the extensor muscle mass. This discomfort is often exacerbated by repetitive pronation and supination (twisting the forearm) or forceful wrist extension, which causes the surrounding tissues to "choke" the nerve. Because the pain site is nearly identical to lateral epicondylitis (Tennis Elbow), many patients suffer through months of failed treatments before realizing that their issue isn't a frayed tendon, but a nerve that is simply struggling for space amidst the muscles of the arm (32).

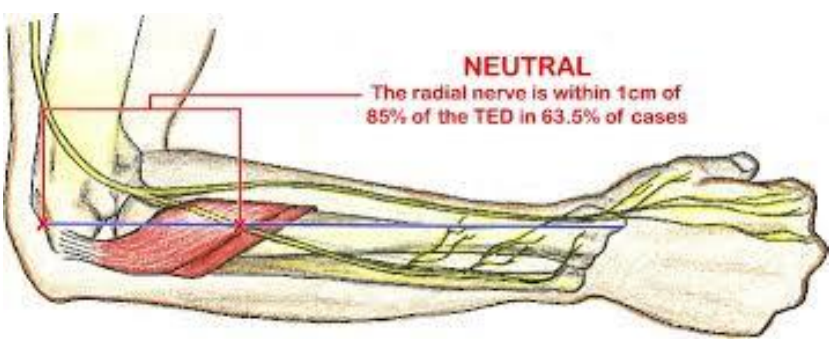

Figure 6 :Radial Tunnel Syndrome – Anatomical Proximity of the Radial Nerve to the Tunnel Entry Point in the Neutral Position (33)

5.1.5. Cubital Tunnel Syndrome (Ulnar nerve entrapment)

CTS represents a compressive neuropathy of the ulnar nerve as it traverses the postero-medial aspect of the elbow, primarily within the fibro-osseous canal formed by Osborne's ligament and the two heads of the flexor carpi ulnaris (FCU). The pathophysiology is driven by mechanical compression and traction-induced ischemia, where increased intraneural pressure leads to microvascular compromise, focal demyelination, and, in chronic stages, axonal degeneration. Clinically, patients present with paresthesia in the ulnar distribution (fifth digit and medial half of the fourth) and, as the condition progresses, motor deficit characterized by weakness of the intrinsic hand muscles (interossei) and a positive Froment's sign. This study advocates for simple in situ decompression, a surgical technique that prioritizes the preservation of the extrinsic and intrinsic blood supply to the nerve. By performing a targeted release of the cubital tunnel retinaculum, surgeons can effectively reduce the pressure gradient and facilitate neural recovery without the morbidity or devascularization risks associated with more extensive anterior transposition procedures (34).

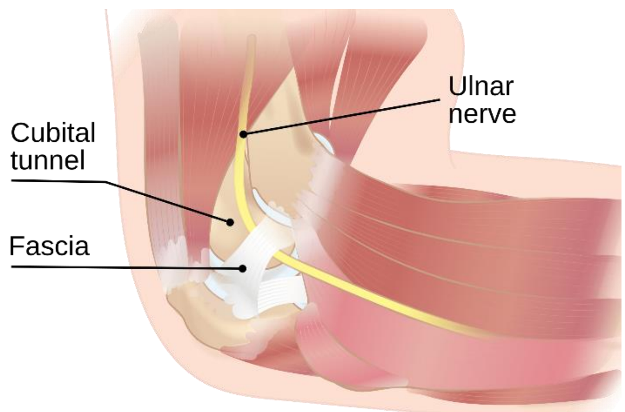

Figure 7: Cubital Tunnel Syndrome – Anatomical Illustration of Ulnar Nerve Entrapment Within the Cubital Tunnel and Surrounding Fascia at the Elbow(35)

5.1.6. Ulnar tunnel syndrome

represents a distinct clinical entity of ulnar nerve compression at the wrist, primarily within Guyon's canal. Unlike the often-idiopathic nature of carpal tunnel syndrome, this condition typically stems from identifiable mechanical etiologies, most frequently carpal ganglia or chronic occupational microtrauma to the hypothenar eminence. The clinical presentation is highly variable and serves as a precise map of the anatomical site of compression; depending on the zone of entrapment, patients may exhibit a blend of motor and sensory deficits, isolated intrinsic muscle paralysis, or more rarely purely sensory changes. A significant diagnostic challenge lies in the frequent five-month delay for Type 2 (purely motor) presentations, as the absence of sensory warning signs often leads patients to overlook early symptoms. Consequently, clinicians must maintain a high index of suspicion when observing spontaneous hand clumsiness in middle-aged patients, utilizing Shea's classification to pinpoint the lesion and guide surgical intervention, such as the excision of occult ganglia to restore function.

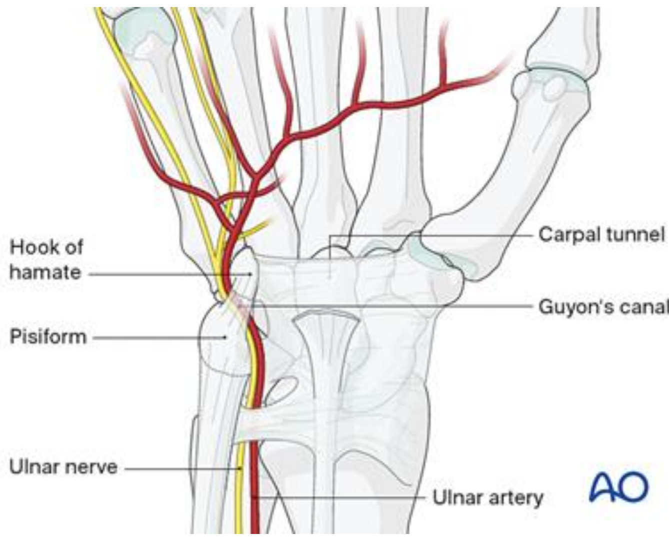

Figure 8 :Anatomy of Guyon's Canal – Illustrating the Ulnar Nerve and Artery in Relation to the Pisiform, Hook of Hamate, and Carpal Tunnel at the Wrist(36)

5.1.7. Carpal Tunnel Syndrome

CTS is the most prevalent entrapment neuropathy, typically arising from a mechanical compression of the median nerve within the narrow fibro-osseous carpal tunnel at the wrist. The etiology is multifactorial, involving personal risk factors such as obesity, pregnancy, and diabetes, which increase pressure within the tunnel, alongside occupational triggers like repetitive hand movements and forceful exertion. Clinically, patients present with hallmark sensory disturbances, including pain and paresthesia in the median nerve distribution specifically the thumb, index, middle, and radial half of the ring finger. A classic diagnostic indicator is the "flick sign," where patients feel the need to shake their hands to relieve nocturnal symptoms. As the syndrome progresses to severe stages, motor fiber damage manifests as thenar eminence atrophy and a noticeable weakness in thumb abduction and opposition. While the diagnosis is primarily clinical, supported by provocative maneuvers like the Phalen and Tinel tests, clinicians often utilize ultrasonography to measure the nerve's cross-sectional area or electrodiagnostic studies to confirm nerve conduction delays and assess the severity of axonal damage(37).

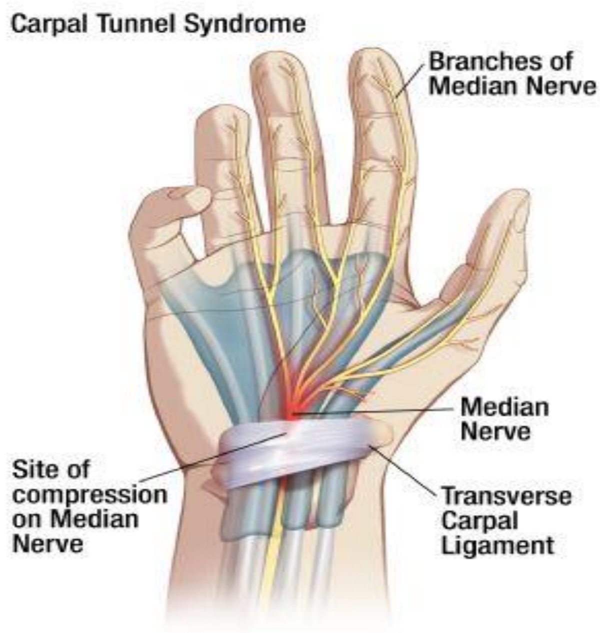

Figure 9 :Carpal Tunnel Syndrome – Anatomical Illustration of Median Nerve Compression by the Transverse Carpal Ligament(38)

5.1.8. Flexor and extensor tendonitis of the hand and fingers

Refers to an overuse-related inflammatory or degenerative disorder of the digital flexor and extensor tendons, often involving the tendon sheath (tenosynovitis), leading to impaired tendon gliding and pain. The etiology is predominantly mechanical, due to repetitive microtrauma and excessive loading (e.g., repetitive gripping, typing, manual labor, or sports), with contributing factors such as poor ergonomics, acute strain, and systemic conditions like rheumatoid arthritis or diabetes that predispose to tendon degeneration. Clinically, patients present with localized pain along the tendon course, exacerbated by active or resisted movement (flexion or extension), stiffness, and sometimes mild swelling; in more advanced cases, triggering or locking phenomena may occur due to impaired tendon excursion. On examination, there is tenderness on palpation of the affected tendon, pain with resisted motion, and preserved passive range of motion unless complicated. The diagnosis is primarily clinical, based on history and physical examination, while imaging (ultrasound or MRI) may be used in uncertain cases to demonstrate tendon thickening or sheath inflammation. This synthesis is based on general orthopedic and hand surgery literature, including standard references such as Green's Operative Hand Surgery and reviews on tendinopathies in journals like The Journal of Hand Surgery(39).

5.1.9. Raynaud's phenomenon or peripheral neuropathy related to vibrations of the hand and arm Prolonged occupational :

Exposure to hand–arm vibration, such as that generated by grinders, drills, chainsaws, and other power tools, leads to a chronic occupational disorder characterized by combined vascular and neurological injury known as hand–arm vibration syndrome. The underlying pathophysiology involves two main interconnected mechanisms. On the vascular side, repeated vibration causes progressive endothelial dysfunction and dysregulation of sympathetic vasomotor control, leading to abnormal vasoconstriction of digital arteries. Over time, structural vascular changes such as intimal thickening and narrowing of the lumen develop, which reduce blood flow to the distal extremities and increase susceptibility to cold-induced vasospasm. Clinically, this manifests as vibration-induced white finger, a secondary form of Raynaud's phenomenon, characterized by episodic attacks of digital ischemia triggered mainly by cold exposure or stress, with typical sequential color changes of the fingers (pallor, cyanosis, then reperfusion redness), accompanied by pain, tingling, and marked cold intolerance. In parallel, the neurological component results from direct mechanical stress on peripheral nerves, repeated microtrauma, and ischemic damage to the vasa nervorum, leading to demyelination and in more advanced cases axonal degeneration, with consequent slowing of nerve conduction. This produces a sensory-predominant neuropathy with symptoms such as numbness, paresthesia, reduced tactile discrimination, and impaired fine motor skills, often affecting both hands in a symmetrical distribution depending on exposure. In addition, vibration exposure may contribute to or aggravate carpal tunnel syndrome by promoting tenosynovial swelling and increasing pressure within the carpal tunnel, thereby compressing the median nerve and producing nocturnal paresthesia and sensory deficits in its distribution. Diagnosis is mainly clinical and relies on a clear occupational history of prolonged vibration exposure combined with compatible vascular and/or neurological symptoms, while excluding primary Raynaud's disease and other causes of peripheral neuropathy. Supporting investigations may include nerve conduction studies, which can reveal median nerve slowing in cases with carpal tunnel involvement, as well as vascular tests assessing abnormal digital blood flow responses. Overall, the condition represents a dose-dependent occupational disorder in which both the severity and likelihood of vascular and neurological damage increase with the intensity and duration of vibration exposure, reflecting a combined microvascular and peripheral nerve injury process that evolves progressively with continued exposure(40).

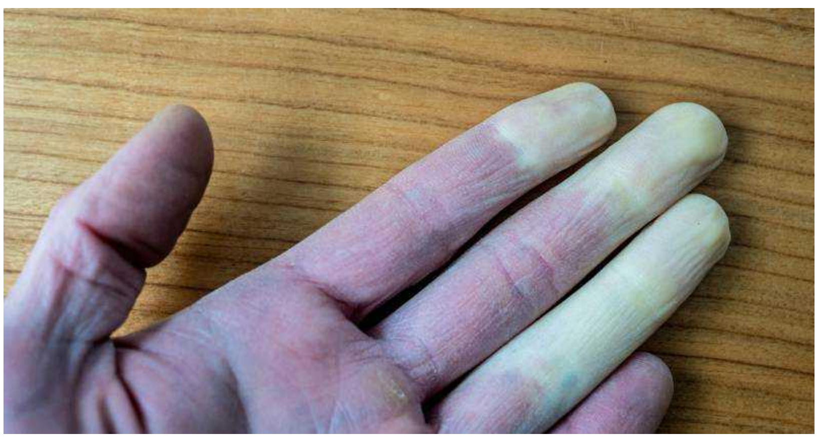

Figure 10:Raynaud syndrome(41)

5.1.10. Osteoarthritis of the elbow, wrist, and fingers :

- **Elbow osteoarthritis** (OA) : presents a unique clinical challenge, as it often deviates from the typical weight-bearing patterns of joint degeneration. Unlike the hip or knee, the etiology of elbow OA is predominantly secondary, frequently rooted in post-traumatic sequelae such as intra-articular fractures or dislocations—or chronic repetitive microtrauma, especially in patients with occupations involving heavy manual labor or high-impact athletics.

The clinical presentation is characterized by a distinct mechanical profile; patients typically report pain at the terminal arcs of motion (extension and flexion) rather than through the mid-range. This is often accompanied by "locking" sensations due to intra-articular loose bodies and, in significant cases, ulnar neuropathy symptoms due to extrinsic compression by osteophytes. In terms of diagnosis, while physical examination reveals a reduced range of motion and palpable crepitus, plain film radiography remains the gold standard, demonstrating characteristic joint space narrowing, subchondral sclerosis, and prominent osteophyte formation. For the clinician, understanding this interplay between previous mechanical trauma and current functional limitation is key to a humanized, patient-centered management plan(42).

Figure 11:AP and profile radiograph of the elbow with osteoarthritis(43)

• **Wrist osteoarthritis** (OA) is among the most frequently encountered conditions in hand surgery practice and yet, it remains one of the most diagnostically nuanced. Its etiology is predominantly post-traumatic: the condition may arise from scaphoid nonunion or malunion, malunited distal radius fractures, disruption of the intercarpal, radiocarpal, radioulnar, or ulnocarpal ligaments, avascular necrosis of the carpus, or developmental abnormalities. Regardless of the underlying cause, the common pathway is the same — abnormal joint loading drives progressive articular cartilage loss, and our patients walk through the door telling us a familiar story.

Figure 12: Radiographic appearance of wrist osteoarthritis showing joint space narrowing(44)

Clinically, they present with a spectrum ranging from mild dorsal swelling to significant wrist pain and progressive limitation of range of motion as the affected articulations degenerate This is precisely where the diagnostic challenge lies: pain from the radiocarpal joint does not feel the same to our patient as pain from the midcarpal joint, yet both may look identical on initial inspection. A meticulous clinical and radiographic evaluation is therefore indispensable the goal being to accurately identify which specific pain-generating articulation is involved ,since treatment decisions hinge entirely on that localization. Standard posteroanterior and lateral radiographs remain the cornerstone of imaging, but the clinician must integrate provocative physical examination maneuvers, fluoroscopic stress views, and targeted intra-articular injections to reach a confident diagnosis. In short, wrist OA demands that we think anatomically, examine systematically, and listen carefully to our patients because the joint they're pointing to is the one we need to treat (45).

- **Osteoarthritis of the fingers** :is an especially prevalent condition among postmenopausal women and one that is too often dismissed as simply "getting older," when in reality it represents a true disease process with measurable structural, functional, and symptomatic consequences. At its core, it is a pathological process that destroys the cartilage of the interphalangeal joints, resulting in pain, swelling, decreased digital range of motion, progressive joint deformities, and significant difficulty performing activities that require grip or pinch. When these patients walk into our clinics usually women in their sixth or seventh decade, they describe hand pain that has quietly eroded their independence: difficulty opening a jar, buttoning a shirt, holding a pen. That is the human cost we must keep in mind.

From an etiological standpoint, the degeneration of articular cartilage at the proximal and distal interphalangeal joints is driven by a combination of age-related biomechanical wear, hormonal influences — particularly the estrogen withdrawal of menopause and genetic predisposition, making this condition as much a systemic vulnerability as a local joint problem. Diagnosis remains clinical: the characteristic bony enlargements known as Heberden's nodes at the DIP joints and Bouchard's nodes at the PIP joints, combined with the history and functional limitations, are usually sufficient to establish the diagnosis, with plain radiographs confirming joint space narrowing, subchondral sclerosis, and osteophyte formation when needed. Management is multimodal analgesics, rest, and supportive splinting alternated with therapeutic mobilization and strengthening exercises, combined with patient education and joint protection strategies all aimed at alleviating symptoms and preserving functional capacity.

finger OA is neither trivial nor inevitable in its consequences, and a structured rehabilitation approach can meaningfully restore quality of life.(46)

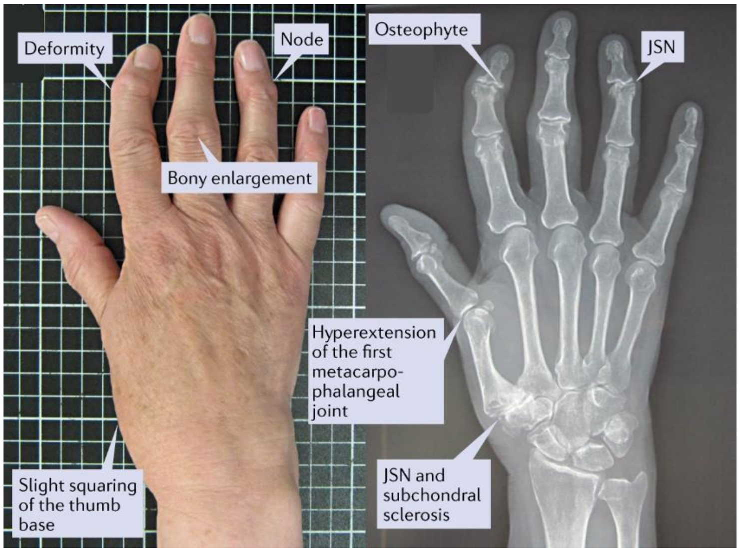

Figure 13: Radiological and clinical signs of osteoarthritis of the fingers(47)

5.1.11. Non-specific MSD-UL :

Musculoskeletal disorders of the upper limb (MSD-UL) are considered non-specific when the combination of symptoms and clinical signs presented does not allow for a specific diagnosis to be made. These conditions may represent early or mild forms of specific MSD-UL, or chronic pain processes that do not fall precisely into any specific pathological category. Non-specific MSD-UL could account for up to 80% of all such conditions. Further research is needed to clarify the validity of this hypothesis(48)

5.2. Spinal MSDs

Spinal Musculoskeletal are the most common occupational injuries among healthcare workers, typically manifesting as inflammatory or degenerative conditions involve the vertebrae, intervertebral discs, ligaments, and supporting muscles in the cervical or lumbar regions due to cumulative mechanical loading.

5.2.1. Cervical SMSDs:

Cervical spinal musculoskeletal disorders, are highly prevalent among healthcare workers. In nursing populations, annual neck pain reports have ranged up to 47.8%, reflecting the significant occupational burden of cervical MSDs in clinical settings and making it one of the most commonly reported anatomical MSD sites(49).Sustained non-neutral postures and repetitive movement patterns common in documentation, patient monitoring, and prolonged clinical tasks contribute to this high prevalence by increasing mechanical stress on cervical structures.

Clinically, cervical SMSDs commonly present as neck pain, stiffness, and reduced range of motion. Some individuals may also experience headaches, shoulder discomfort, or radiating pain if nerve roots are affected. Symptoms often persist beyond periods of activity, reflecting an ongoing inflammatory and degenerative process.(50)

5.2.2. Lumbar SMSDs:

Lumbar spinal musculoskeletal disorders are among the most prevalent work-related musculoskeletal complaints in healthcare workers, particularly nurses, due to the physical demands of patient handling, prolonged standing, bending, and twisting.(51)

These disorders are clinically categorized into mechanical strain and discogenic disorders. Mechanical strain involves the acute overstretching or microscopic tearing of the paraspinal muscles and ligaments. In contrast, discogenic disorders such as Lumbar Disc Herniation result from cumulative exposure to heavy lifting. This causes the intervertebral discs, specifically at the L4-L5 and L5-S1 segments, to bulge or rupture under pressure. This structural failure frequently leads to Sciatica, where compressed nerve roots cause sharp, radiating pain and numbness that travels from the lower back through the leg, significantly impairing work capacity.

In addition to pain, lumbar MSDs may cause stiffness, decreased spinal mobility, and involuntary muscle spasms as a protective response. In advanced cases, affected individuals can experience sensory changes such as burning or tingling, along with localized weakness, indicating notable involvement of the nerve roots.

5.3. Lower limb MSDs

Lower limb MSDs are primarily localized at the three main joint regions: the knee, the foot, and, less frequently, the hip. As with upper body MSDs, those affecting the lower limbs arise primarily from repetitive execution of the same movements, resulting in repeated microtrauma. The risk is further increased by specific gestures and postural demands, including activities performed at extreme joint ranges, excessive force exertion, or tasks carried out in sustained static positions.(52)

5.3.1. Knee MSDs:

Knee-related MSDs are common conditions affecting the knee joint and are characterized by cartilage degradation, joint pain, stiffness, swelling, and reduced functional mobility. Although these disorders are most prevalent in individuals aged 50 and older, similar risk factors may apply to occupational settings. Modifiable factors, such as obesity and overweight, significantly increase susceptibility. Previous knee injuries also elevate risk, while female gender appears to be associated with higher prevalence. Non-modifiable factors, including age and sex, should be considered when assessing risk profiles. (53)

Knee MSDs can lead to clinical conditions such as meniscal injuries, ligament tears (ACL, MCL, PCL), patellofemoral pain syndrome, tendinopathies, and osteoarthritis. Occupational activities like kneeling, squatting, and heavy lifting increase joint stress and risk of these conditions. Prior injuries further elevate the likelihood of degenerative changes and functional impairment.(54,55)

5.3.2. Foot MSDs:

For healthcare professionals, particularly nurses who spend a significant amount of time on their feet during their shifts, foot MSDs are of particular concern due to their prevalence and impact on work performance and quality of life. Studies have shown that foot MSDs can lead to activity limitations and may be associated with risk factors such as obesity, poor physical health, and working in high-demand environments like intensive care units. These disorders arise from repetitive mechanical stress on the foot and ankle structures, leading to microtrauma and soft tissue strain.(56,57)

6. Risk Factors

6.1. Individual Factors and Biological Predispositions

When we look at people who work in healthcare, we see that some things about them can make them more likely to get hurt on the job. These things are a part of who they're and cannot be changed. The study found that some biological and demographic things can make people more likely to get Work-Related Musculoskeletal Disorders or WRMSDs :

Age and Skeletal Degradation: As people get older, they are more likely to get hurt. The study in Damascus found that older staff were more likely to get WRMSDs. This is because as we get older our bones get weaker and our joints start to break down. We can also get problems with our spine like our discs getting narrower. All of these things can make it harder for us to move around. Can cause pain.

Gender Dimorphism: Women who work in healthcare are more likely to get hurt than men. This is because women are generally smaller and have muscle mass than men. They may also have to do tasks that're harder for them because they were designed for men. For example, women may have to lift patients or equipment that is not made for them. This can cause strain on their bodies. Lead to injury.

Body Mass Index (BMI) and Metabolic Processes: Being overweight is a risk factor for getting hurt on the job. The study in Syria found that people who were overweight were more likely to get WRMSDs. This is because being overweight can put strain on our joints and can cause problems with our metabolism. On the hand being underweight can actually help protect us from getting hurt.

Comorbidities and Sarcopenia: Some people may have health problems that can make them more likely to get hurt. For example, people who have sarcopenia or a loss of muscle mass and strength may be more likely to get hurt. This is because they may not be able to move as well or do their jobs as easily also Underlying pathologies (spinal deformities such as scoliosis, fractures, etc.).

Smoking: Nicotine has vasoconstrictive effects and impairs proper blood circulation. then receive a reduced nutritional supply.

Sedentary lifestyle: Lack of physical activity is one of the most common risk factors for low back pain. In fact, contrary to popular belief, it is advised to gradually (re)start physical activity to prevent or relieve lumbar discomfort.

Lack of hydration: Pulpy discs separate the vertebrae; if they become dehydrated, they lose volume and cause the vertebrae to compress against each other.

Diet : A diet too rich in saturated fats and sugars promotes the inflammatory process, thereby increasing the risk of musculoskeletal disorders. Poor nutritional habits can impair tissue repair, reduce muscle strength, and exacerbate chronic pain conditions, making dietary quality an important modifiable risk factor in the prevention of work-related musculoskeletal disorders.

Pregnancy: The weight of the baby often shifts the center of gravity, impacting the curvature of the lower back through compensation. This is referred to as hyperlordosis (58) .

6.2. Psychosocial Factors and Stress Dynamics

When we think about why people get hurt on the job we often think about things like lifting heavy objects. We also need to think about psychological things like stress and anxiety. The "biopsychosocial" model of health says that physical pain is often connected to mental and emotional stress.

We found that there are two kinds of stress: "General Stress". Work Stress." General stress is when we feel anxious or overwhelmed in our lives. Work stress is when we feel overwhelmed or anxious at work. Both kinds of stress can affect our bodies. Make us more likely to get hurt .(59)

Furthermore, when we are stressed at work it can affect our bodies in ways. For example, if we are feeling overwhelmed or anxious we may tense up our muscles, which can lead to pain. This is especially true for healthcare workers who have to make decisions and take care of patients. (60)

People who are unhappy with their job especially when they have to do the thing over and over and have to work very fast are more likely to get musculoskeletal disorders. This is because they get stressed and their body stays tense, which is bad for their muscles in the neck, shoulders and lower back. When this happens for a time, it can cause small injuries reduce blood flow and make their muscles tired. Doing the thing all the time means they use the same muscles over and over without resting and working too fast means they do not get enough time to rest which makes them even more tired. Also, people who do not like their job might not pay attention to how they sit or stand and might not take breaks, which can put strain on their muscles and bones.

When people do not have support, from others they might feel more stressed. Have a harder time dealing with problems, which can make their muscles stay tense and hurt for a longer time. These things often happen when the work environment is not good which can make the problems even worse. So musculoskeletal disorders happen because of things, including stress and physical factors which is why we should look at the whole person, not just their body, when trying to understand why they got sick. (57)

6.3. Organizational Factors and Labor Demands

The way that healthcare organizations are set up can also affect how likely people are to get hurt on the job. If organizations are understaffed or if people have to work many hours it can put extra strain on employees. Working than 7 hours a day or more than 30-40 hours a week can increase the risk of injury.

In Syria many doctors have left the country, which means that the remaining staff have to do work. This can be especially hard for doctors who have to do tasks that they were not trained for like lifting patients. The study found that doctors are twice as likely to get hurt as nurses, which's a big problem.(58)

6.4. Biomechanical Factors and Physical Strain

Biomechanical stressors are things that can cause strain on our bodies. These can include things like lifting objects standing for long periods of time or doing repetitive tasks. Medical students who sat for than 4 hours a day were more likely to get low back pain

Forceful Repetition: Doing tasks can cause strain on our muscles and joints. medical students who did tasks were more likely to get musculoskeletal (60).

Static Loading: Sitting or standing for periods of time can be bad for our spines. The nurses who had to sit or stand for periods of time were more likely to get musculoskeletal disorders.

Awkward and Non-Neutral Postures: If we have to twist or bend in ways it can put strain on our joints. nurses who had to do tasks that required postures were more likely to get musculoskeletal disorders.(59)

6.5. Environmental Factors and Infrastructure

The physical environment of a healthcare organization can also affect how likely people are to get hurt on the job. If the equipment is not designed well or if the infrastructure is not good it can cause strain on employees. Also the medical students who had to work in designed amphitheaters were more likely to get low back pain.(60)

Lighting and having to move around a lot can cause strain on employees. When the environment is not designed well employees have to compensate by using postures, which can lead to injury.

7. Prevention

7.1. Primary Prevention

To prevent injuries healthcare organizations need to make changes at the level. This means looking at the root causes of injuries and making changes to prevent them. physical exercise to strengthen back muscles

- **Ergonomics Training Programs**: Healthcare organizations should provide training programs to help employees learn how to lift and move patients safely.

- **Workload Management**: Organizations should manage the workload of employees to prevent overload also clearing circulation areas to avoid accidental falls.

- **Staffing Policy**: Organizations should have a staffing policy that ensures there are employees to do the work safely.

- **Metabolic Support**: Organizations should provide support to help employees manage their weight and get stronger.The evaluation of prevention actions clearly shows that in early prevention, (possibly combined with educational interventions and physical exercises) is a determining factor in preventing low back pain.

- **Work Station**: We need to change the way work stations are set up in labs and nursing stations so people do not have to sit for long or bend their necks.

- **Job Rotation**: We can set up a system where people switch between jobs and easier jobs so they can rest and recover.

- **Tool Design**: We can make tools, for surgeons and dentists that are easier to use and do not hurt their hands or wrist.(61)

7.2. Secondary Prevention

To prevent injuries from becoming chronic healthcare organizations need to have a system in place for intervention. This means identifying problems and providing treatment to prevent them from getting worse.

22% of employees who had low back pain sought medical attention. This is a problem because it means that many employees are not getting the help they need to prevent their injuries from getting worse. Healthcare organizations need to have a system in place to encourage employees to seek attention early and to provide treatment to prevent injuries from becoming chronic.

Institutions need to make rules that require checks for muscle and bone problems just like we do for overall health checks every year. We have to make it easier for people to get help when they need it and stop the idea that we should just "tough it out" when we are in pain. This is really important for finding problems

We also need to use tools like ultrasound machines to look at muscles and bones. These machines are good at finding problems on and they do not cost too much.(58)

7.3. Tertiary Prevention

This may include physical rehabilitation programs, advice on pain management, complementary therapies such as physiotherapy or occupational therapy, as well as workstation modifications to prevent aggravation or relapse.

We can use medicines like Meloxicam to help with pain. This medicine has been shown to work well and it can reduce pain from a 6.58 to a 2.48 on a pain scale.

Local Injections: Sometimes we need to give shots to help with pain when medicines do not work. 22.1% Of people need these shots.

Occupational Physician need to be more involved in helping people get back to work after they have been hurt. They need to make sure that people with long-term problems can still work. With some changes to their job so they do not have to retire too early.(62)

MATERIALS AND METHODS

1. Type of study

This study is an observational descriptive cross-sectional epidemiological study conducted across the various departments of the Colonel Lotfi Hospital of Laghouat.

2. Study context

Our study was conducted over a period from January to April 2026. The survey involved the medical and paramedical health personnel of various departments of the EPH Laghouat, which consists of

Eleven departments: Emergency pavilion, Infectious diseases department, Orthopedics department, Cardiology department, Nephrology department, Internal medicine department, Pediatrics department, Pulmonology department, Intensive care unit, Male and female surgery departments, central laboratory and the Operating theater.

Healthcare professionals from different departments were included to ensure broad representation of the hospital workforce.

3. Study Population

We chose to conduct our research among a multidisciplinary team including doctors, nurses ,radiology technicians ,laboratory technicians and paramedics. because, in these professional categories, the dynamic movement of different parts of the body is essential to perform various work-related tasks , making them particularly susceptible to musculoskeletal disorders.

The questionnaire was developed and distributed specifically to these individuals, who subsequently completed it during the study period.

4. Principal Objective

To determine the prevalence of musculoskeletal disorders (MSDs) among healthcare professionals working in the 240-bed mixed Public Hospital (EPH) of Laghouat during the year 2025.

5. Secondary Objectives

- To assess the distribution of MSDs according to sociodemographic factors, such as age, sex, and body mass index (BMI).
- To identify the most affected anatomical regions (neck, shoulders, back, etc.) among healthcare professionals.
- To analyze the association between occupational factors (department, working hours, shift type, repetitive movements, patient handling) and the occurrence of MSDs.
- To evaluate differences in MSD prevalence among professional categories (doctors, nurses, technicians, paramedics, caregivers).
- To provide recommendations for preventive strategies aimed at reducing MSDs

6. Inclusion criteria

All medical and paramedical health personnel from the medical and surgical departments of the 240-bed mixed Public Hospital (EPH) of Laghouat who experienced musculoskeletal disorders (MSDs) during 2026 were included in our study, provided they:

- Were active healthcare workers at EPH Laghouat during the study period.

- Had at least 6 months of continuous work experience (to ensure exposure to occupational risk factors).

- Provided informed consent to participate.

7. Exclusion criteria

- Participants were excluded from the study if they:
- Declined to participate or did not provide informed consent. Were on long-term leave during the study period (e.g., maternity, sick leave, or extended vacation).
- Were administrative staff or other non-clinical personnel with minimal exposure to work-related physical demands.
- Had pre-existing musculoskeletal or systemic conditions known to affect the musculoskeletal system independently of occupational exposure, such as congenital disorders, chronic orthopedic diseases, rheumatoid arthritis, chronic kidney disease, or a history of major trauma.

8. Sampling Method

A census sampling approach was used, where all eligible healthcare professionals working during the study period were invited to participate.

This method was chosen to maximize representativeness and reduce sampling bias

9. Data Collection Tool

Data were collected using a structured, self-administered questionnaire, composed of three sections:

9.1. Socio-demographic and Occupational Variables

- **Age:** Recorded as a continuous quantitative variable, representing the participant's age in years at the time of the study.
- **Gender:** A binary qualitative variable categorized as either Male or Female.
- **Anthropometric Data**: This includes Height (measured in cm) and Weight (measured in kg), which allow for the calculation of the Body Mass Index (BMI).
- **Current Profession:** Identifies the participant's specific job title, such as medical, paramedical or a surgeon.
- **Work Department:** Specifies the hospital or clinical unit where the participant is currently stationed.
- **Professional Seniority:** The total duration of service in the current position, expressed in years and months, to assess long-term physical exposure**.**

9.2. Variables related to medical and occupational history

9.2.1. Medical History Variables

To isolate the impact of occupational risk factors, certain medical history variables served as exclusion criteria.

- **Medical history** : Chronic Kidney Disease or Chronic Autoimmune Diseases

- **Sequelae of Previous Injuries:** Assessment of any persisting symptoms or functional limitations resulting from past physical traumas or injuries**.**

9.2.2. Occupational History

- **Work Schedule Type:** Categorized as either a fixed (regular) schedule or a variable (shift-based) schedule**.**

- **Work Shift Timing:** A qualitative variable identifying the primary time of work, categorized into day shifts, evening shifts, night shifts, or rotating shifts.

- **Weekly Work Frequency:** A quantitative variable representing the number of working days per week (ranging from 1 to 7 days).

- **Total Weekly Working Hours:** A quantitative variable documenting the approximate total number of hours worked per week.

- **Extended Work Shifts:** A binary variable indicating whether the participant frequently works shifts exceeding 10 hours at least once a week.

9.3. Nordic Musculoskeletal Questionnaire (NMQ)

MSDs were assessed using the Nordic Musculoskeletal Questionnaire (NMQ), internationally validated for identifying symptoms in:

- Neck
- Shoulders
- Elbows
- Wrists/Hands
- Upper back
- Lower back
- Hips/Thighs
- Knees
- Ankles/Feet

For each anatomical region, the tool employs a multi-dimensional screening approach:

- **12-Month Prevalence:** Captures the presence of any ache, pain, or discomfort during the previous year to establish chronic or recurring issues.

- **Functional Impact:** Records whether symptoms were severe enough to prevent the participant from performing their normal duties (occupational or domestic) during the 12-month period.

- **7-Day Point Prevalence:** Identifies acute or current symptoms experienced within the week leading up to the survey.

- **Pain Intensity (Numeric Rating Scale):** A quantitative assessment where participants rate their pain on a scale from **0 (No pain)** to **10 (Severe pain)**. This allows for the calculation of mean pain scores and statistical comparison across different demographic or occupational groups.

10. Data Collection Procedure

- After obtaining administrative authorization, the questionnaire was distributed to healthcare staff during work hours.
- Participants completed the questionnaire anonymously to ensure confidentiality.
- Completed questionnaires were collected on the same day to avoid loss of data.

11. Materials and Tools

Several tools and resources were employed throughout the design and presentation of this study. Data on musculoskeletal disorder prevalence were collected using the Nordic Musculoskeletal Questionnaire (NMQ), a standardized and validated instrument widely used in occupational health research for the assessment of musculoskeletal symptoms across body regions. Statistical analyses and percentage calculations were performed using Microsoft Excel. Data visualization, including the generation of pie charts and bar charts, was carried out using ChartExpo (chart-expo.com), an online charting platform that produces high-quality figures suitable for academic publication. The formatting, structuring, and tabulation of results presented in this manuscript were assisted by Claude (Anthropic), an assistant used to support the academic presentation of data, including table design and document formatting. Body Mass Index (BMI) was calculated from self-reported height and weight measurements provided by participants in the questionnaire.

RESULTS

1. Descriptive Results

The primary objective of this study is to assess the prevalence to of musculoskeletal disorders (MSDs) among healthcare professionals working in the 240-bed mixed Public Hospital (EPH) of Laghouat during the year 2026. also to assess the distribution of MSDs according to sociodemographic factors, such as age, sex, and (BMI) and to identify the most affected anatomical regions (neck, shoulders, back, etc.) among healthcare professionals.

Over the four-month study period, we surveyed 248 HCWs.

1.1. Socio-demographic and occupational characteristics of the study sample

This study was conducted among 248 healthcare workers (HCWs) employed in a hospital setting. The sample was predominantly female, with 140 women (56.6%) compared to 108 men (43.4%), reflecting the well-documented feminization of healthcare professions, particularly in nursing and paramedical roles.

Regarding age distribution, the sample was relatively young. The largest group was aged 31 to 40 years (n=114, 45.8%), followed by those aged 20 to 30 years (n=86, 34.5%). Healthcare workers between 41 and 50 years accounted for 13.7% of the sample (n=34), while those over 50 years of age represented only 2.4% (n=6). The estimated median age of the study population was 34 years, indicating that the majority of participants were in the early to mid-stages of their professional careers a period associated with high physical workload and significant exposure to musculoskeletal disorder (MSD) risk factors.

Body Mass Index (BMI) assessment revealed that the majority of participants had a normal weight (BMI 18.5–24.9 kg/m²), accounting for 53.8% of the sample (n=134). Overweight (BMI 25–29.9 kg/m²) was observed in 72 participants (28.9%), a notable proportion given that excess body weight is a well-established risk factor for MSDs, particularly in physically demanding occupations. Underweight (BMI <18.5) was recorded in 16 individuals

(6.4%), and obesity (BMI ≥30) affected only 6 participants (2.4%). Taken together, approximately one-third of the HCWs studied presented with overweight or obesity, which may amplify mechanical strain on the musculoskeletal system.

With respect to daily working hours, 180 participants (72.3%) reported working more than 10 hours per day on certain occasions, while 66 HCWs (26.5%) did not. Extended working hours are among the most consistently reported occupational risk factors for MSDs in the healthcare setting, as prolonged shifts are associated with cumulative physical fatigue, insufficient recovery time, and sustained exposure to awkward postures and repetitive patient handling tasks.

Analysis of professional seniority showed that a large majority of participants were in the early stages of their careers. Specifically, 102 HCWs (41.0%) had fewer than 5 years of experience, and 83 (33.3%) had between 5 and 10 years of seniority. Together, these two groups represented nearly three-quarters of the total sample (74.3%). Healthcare workers with 11 to 20 years of experience accounted for 17.3% (n=43), while those with more than 20 years of seniority were a minority (4.4% for 21–30 years and 3.6% for over 30 years). This predominance of early-career professionals underlines the importance of early preventive interventions targeting MSD risk factors from the outset of professional practice.

Regarding the professional category, nurses constituted the largest occupational group with 96 participants (38.6%), closely followed by non-surgical physicians (n=92, 36.9%). Surgeons represented 18.1% of the sample (n=45), while technicians were the least represented category (n=15, 6.0%). The overrepresentation of nurses and physicians is consistent with the typical composition of hospital staff and with existing literature identifying these groups as particularly vulnerable to MSDs, due to frequent patient handling, prolonged constrained postures, and highly repetitive manual tasks.

Table 2:Sociodemographic and occupational characteristics of the study sample

Characteristics of the Study Population (N = 248)		
Variable	**n**	**%**
Sex		
Male	108	43.4%
Female	140	56.6%
Age group		
20–30 years	86	34.5%
31–40 years	114	45.8%
41–50 years	34	13.7%
>50 years	12	4.8%
Body Mass Index (BMI)		
Underweight (<18.5)	16	6.4%
Normal weight (18.5–24.9)	150	60.5%
Overweight (25.0–29.9)	56	22.6%
Obese (≥30.0)	6	2.4%
Works more than 10 hours per day (on certain occasions)		
Yes	180	72.3%
No	66	26.5%
Professional seniority		
<5 years	102	41.0%
5–10 years	83	33.3%
11–20 years	43	17.3%
21–30 years	11	4.4%
>30 years	9	3.6%
Professional category		
Non-surgical physicians	92	36.9%
Surgeons	45	18.1%
Nurses	96	38.6%
Technicians	15	6.0%

1.2. The prevalence of MSDs among the studied population

The survey results reveal a significant health challenge within the healthcare workforce, showing that a vast majority of the 248 participants are currently suffering from musculoskeletal disorders. Specifically, the data indicates that 79.8% of the surveyed individuals totaling 198 workers are classified as the affected population. This leaves a much smaller group of only 50 individuals, or 20.2%, who are considered healthy and free from these physical ailments. These findings highlight a critical burden of physical strain, suggesting that nearly four out of every five healthcare professionals in this group are experiencing work-related bodily discomfort. Such high prevalence rates .

Table 3:The prevalence of musculoskeletal disorders among the studied population

Category	Number of Cases	Percentage (%)
Affected Population	198	79.8%
Healthy Population	50	20.2%
Total	**248**	**100%**

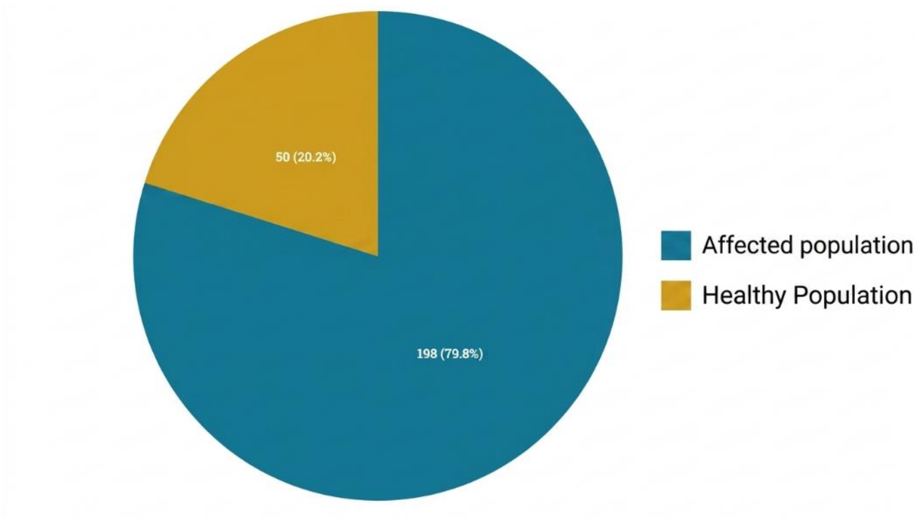

Figure 14:The prevalence of musculoskeletal disorders in the studied population

1.3. Socio-demographic and occupational characteristics of the affected population

1.3.1. Gender

The survey findings regarding the gender distribution of the affected population indicate a clear female predominance among those experiencing symptoms. Specifically, women make up the majority of the group at 62.8%, while men account for the remaining 37.2%.

Table 4: Gender Distribution of the Population Affected by Musculoskeletal Disorders (MSDs)

Gender	Number of Cases	Percentage (%)
Female	124	62.8%
Male	74	37.2%
Total	**198**	**100%**

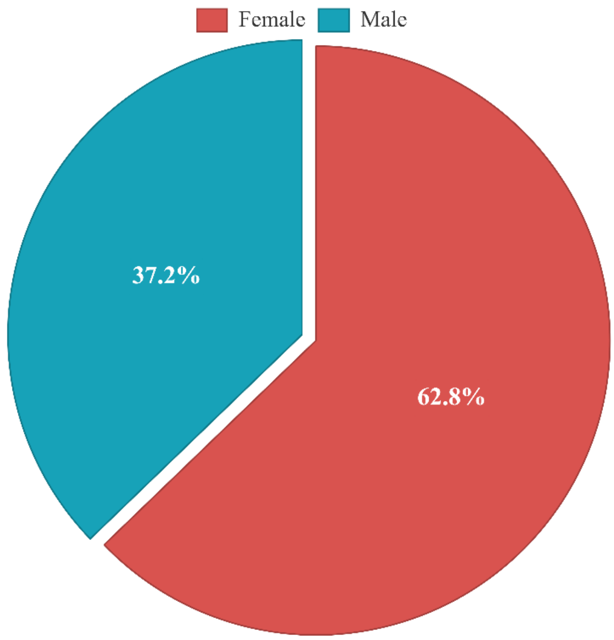

Figure 15:Gender Distribution of the Population Affected by Musculoskeletal Disorders (MSDs)

When comparing these findings to the general population distribution of 56.6% female and 43.4% male, it becomes evident that the prevalence of symptoms among women is disproportionately high. While the overall workforce has a female majority, the affected group shows an even sharper lean toward women at 62.8%, representing a notable increase over their baseline representation in the survey. Conversely, the proportion of men in the affected group (37.2%) is lower than their 43.4% presence in the general population. This suggests that female healthcare workers may face a heightened risk or higher sensitivity to these physical stressors, potentially due to differences in specific job tasks, equipment ergonomics not being tailored to their stature, or varying physiological responses to repetitive clinical labor.

1.3.2. Age

The survey results demonstrate that the relatively lower number of cases in the older age groups is a direct reflection of their smaller representation within the overall study. Among the 198 individuals experiencing symptoms, those over the age of 50 represent the smallest segment with only 12 individuals, while the 41 to 50 age group follows with 32 individuals. This scarcity of older participants suggests that the workforce surveyed is predominantly composed of younger to middle-aged professionals, which naturally results in fewer reported cases for the senior age brackets. Consequently, the high concentration of symptoms in the younger cohorts is not necessarily indicative of higher risk alone, but rather highlights that the study population itself is largely comprised of workers in the earlier stages of their careers.

Table 5:Distribution of the Affected Population by Age Group

Age Group	Number of Cases	Percentage (%)
20–30	66	33.3%
31–40	88	44.4%
41–50	32	16.2%
>50	12	6.1%
Total	**198**	**100%**

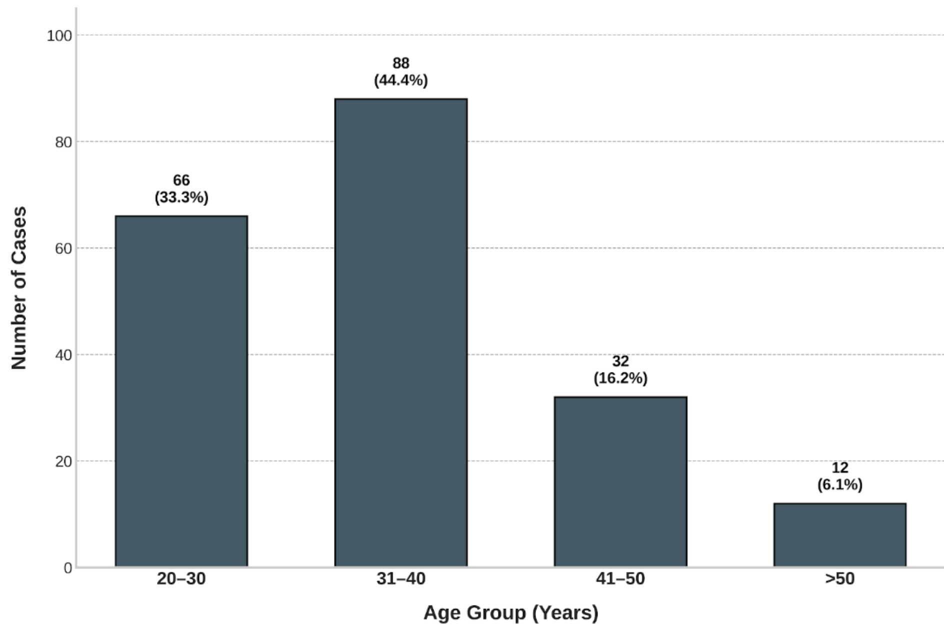

Figure 16: Distribution of the Affected Population by Age Group

1.3.3. Job Category

The survey findings regarding the professional distribution of musculoskeletal disorders reveal that nurses are the most heavily impacted group, with **85 individuals** reporting symptoms. This high prevalence is followed closely by non-surgical physicians, who account for **68 cases**, while surgeons and technicians represent smaller portions of the affected population with **36** and **6 cases**, respectively. When viewed alongside the overall survey data, these figures indicate that the physical burden of clinical work is most concentrated among nursing staff and general medical practitioners, likely due to the high frequency of patient handling, repetitive tasks, and long hours spent in standing positions. The significantly lower number of cases among technicians suggests they may make up a smaller segment of the total surveyed workforce or have different occupational exposure levels compared to the primary caregiving roles.

Table 6: Distribution of the Affected Population by Job category

Job Category	Number of Cases	Percentage (%)
Non-surgical Physicians	68	34.3%
Surgeons	36	18.2%
Nurses	85	42.9%
Technicians	9	4.5%
Total	**198**	**100%**

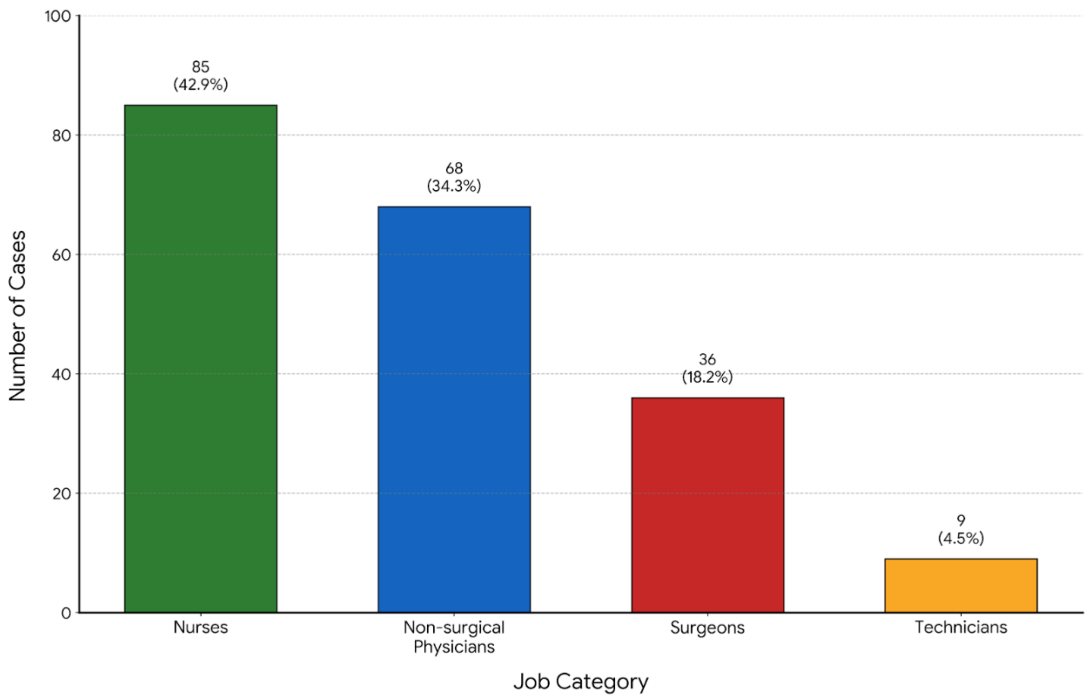

Figure 17: Distribution of the Affected Population by Job category

When analyzing the prevalence of musculoskeletal symptoms across different professional categories, it is clear that certain roles face a much higher relative risk than others. Nurses represent the most affected group both in absolute numbers and percentage, with an alarming 88.5% prevalence rate (85 out of 96), highlighting the extreme physical toll of bedside care and patient handling. Surgeons follow closely with a high prevalence of 80% (36 out of 45), likely due to prolonged static postures and repetitive precision movements in the operating room. Non-surgical physicians also show significant impact at 73.9% (68 out of 92), a rate that remains high despite often having different physical demands than nursing or surgery. In contrast, Technicians exhibit the lowest prevalence at 40% (6 out of 15), which is significantly lower than the other three groups. This professional breakdown suggests that while musculoskeletal issues are widespread across the entire survey population, the risk is most concentrated in nursing and surgical roles, where physical labor and postural stress are most intense.

1.3.4. Professional Seniority

The survey findings regarding professional seniority indicate that musculoskeletal symptoms are overwhelmingly concentrated in the early stages of a career, with 85 individuals (less than 5 years of experience) and 58 individuals (5 to 10 years of experience) comprising the vast majority of the affected group. However, this distribution is largely influenced by the demographic makeup of the participants, as the sample is primarily composed of younger professionals, while senior healthcare workers with more than 20 or 30 years of experience are far less represented in the study. Because these senior individuals are rare within the surveyed population, the lower number of reported cases in those brackets—11 and 8 individuals, respectively—does not necessarily imply a lower risk for veteran staff, but rather reflects the scarcity of older participants available for the survey.

Table 7:Distribution of the Affected Population by Professional Seniority

Professional Seniority	Number of Cases	Percentage (%)
< 5 years	85	42.9%
5–10 years	58	29.3%
11–20 years	36	18.2%
21–30 years	11	5.6%
> 30 years	8	4.0%
Total	**198**	**100%**

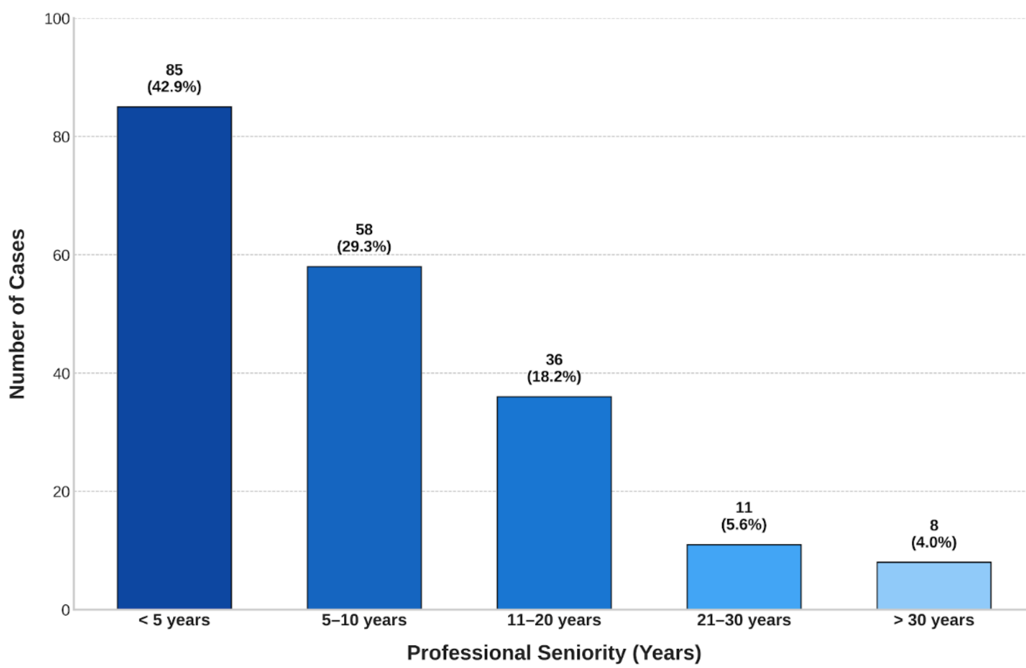

Figure 18:Distribution of the Affected Population by Professional Seniority

while the absolute number of symptomatic individuals is highest among junior staff, the actual prevalence rates across the general population highlight an extreme risk for more senior employees. Although the total count of veteran healthcare workers in the study is low, their ratios of involvement are the highest recorded: those with 21 to 30 years of experience show a 100% prevalence rate (11 out of 11), and those with over 30 years are at 88.8% (8 out of 9). In comparison, the younger cohorts—who make up the majority of the survey participants—show ratios of 83.3% (85 out of 102) for those with less than 5 years and 69.8% (58 out of 83) for the 5-to-10-year group. These ratios clarify that the smaller bars in the seniority chart do not indicate a drop in risk, but rather confirm that senior staff are rare in the sample; when they are present, they are almost universally affected by musculoskeletal symptoms.

1.3.5. BMI

The survey results for the affected population indicate that the majority of symptomatic individuals fall within the Normal weight (18.5–24.9) category, comprising 116 cases. This is followed by the Overweight (25.0–29.9) group with 48 cases, while the Underweight (<18.5) and Obese (≥30.0) categories represent smaller segments with 16 and 6 cases, respectively. These findings highlight that musculoskeletal disorders are prevalent across all body types.

When comparing these findings to the general population distribution, it is clear that certain groups face an exceptionally high risk. While the Normal weight group represents the largest number of cases, the prevalence within the Overweight category is also significant, with 85.7% of that group (48 out of 56) reporting symptoms. Most notably, both the Underweight and Obese categories show a 100% prevalence rate, as every individual surveyed in those brackets—16 and 6, respectively—is part of the affected population. This indicates that while the total volume of cases is driven by the larger number of normal-weight staff in the workforce, those at the outer ends of the BMI spectrum appear universally impacted by MSDs.

Table 8:Distribution of the Affected Population by Body Mass Index (BMI)

BMI Category	Number of Cases	Percentage (%)
Underweight (< 18.5)	16	8.1%
Normal Weight (18.5–24.9)	128	64.6%
Overweight (25.0–29.9)	48	24.2%
Obese (≥ 30.0)	6	3.0%
Total	**198**	**100%**

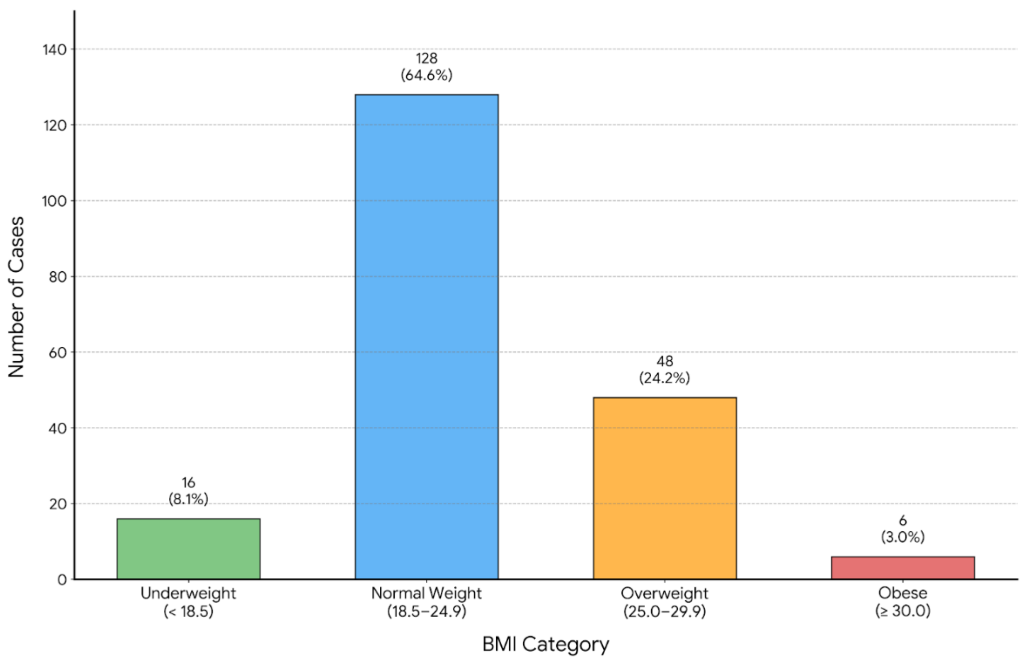

Figure 19:Distribution of the Affected Population by Body Mass Index (BMI)

1.4. Temporal Work Characteristics of the Affected Population

1.4.1. Weekly Work Hours

The survey findings concerning weekly work hours reveal that a substantial majority of the affected population works high-intensity schedules. The largest segment, comprising 108 individuals (56.3%), works between 30 and 40 hours per week, while an additional 66 individuals (34.4%) work more than 40 hours. Together, these two groups account for over 90% of all reported musculoskeletal cases, suggesting a strong correlation between long work weeks and physical ailment. In contrast, only 18 individuals (9.4%) working less than 30 hours per week reported symptoms, indicating that reduced exposure to the clinical environment may significantly lower the risk of developing these disorders.

When comparing these figures to the broader study context, it is clear that individuals working more than 30 hours are the primary drivers of the survey's high prevalence rate. Specifically, out of the 198 total affected individuals identified in the initial survey, those working extensive weekly hours represent the vast majority of the symptomatic group. This distribution emphasizes that as work volume increases, the opportunity for physical recovery decreases, making high-duration shifts a primary risk factor for the healthcare workers in this sample.

Table 9: Distribution of the Affected Population by Weekly Work Hours

Weekly Work Hours	Number of Cases	Percentage (%)
Less than 30 hours	24	12.1%
30–40 hours	108	54.5%
More than 40 hours	66	33.3%
Total	**198**	**100%**

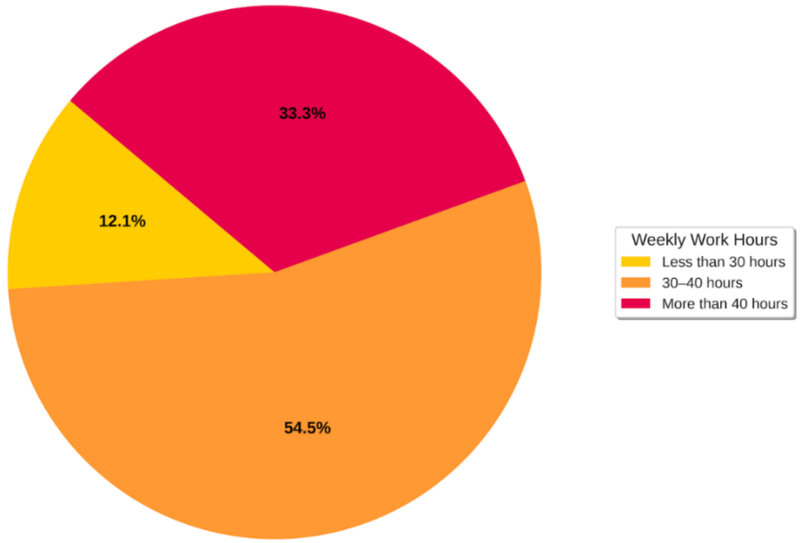

Figure 20: Distribution of the Affected Population by Weekly Work Hours

1.4.2. Shift Type

The pie chart illustrates the distribution of work schedules among healthcare workers included in the study. The majority of participants are assigned to fixed morning shifts, representing 102 individuals (52.0%). Rotating shift work constitutes the second largest group, with 82 healthcare workers (41.8%). In contrast, only a small proportion of participants, 12 individuals (6.1%), are working fixed night shifts. Overall, fixed morning schedules predominate, while rotating shifts also account for a substantial share, and fixed night work remains relatively uncommon in this sample.

Table 10:Distribution of the Affected Population by shift type

Shift Type	**Number of Cases**	**Percentage (%)**
Fixed Morning Shift	102	51.5%
Fixed Night Shift	14	7.1%
Rotating Shift	82	41.4%
Total	**198**	**100%**

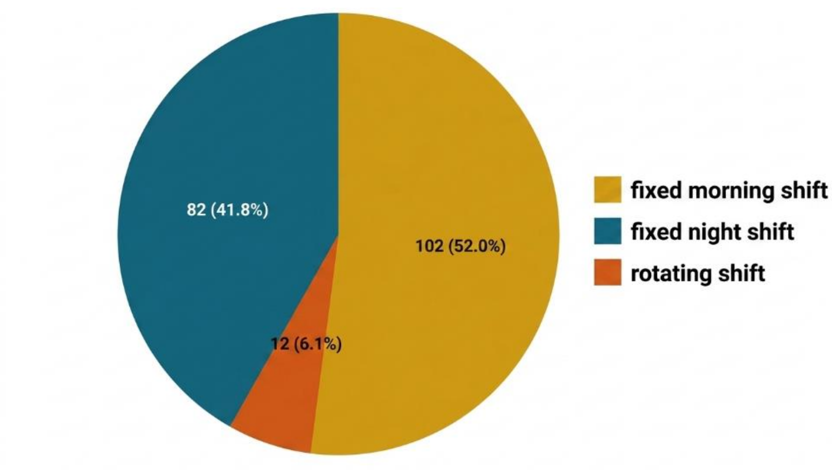

Figure 21:Distribution of the Affected Population by shift type

1.4.3. Working at least one 10-hour shift per week

The survey findings indicate that a significant majority of the affected population frequently works extended shifts. Among those reporting musculoskeletal symptoms, 150 individuals (75.8%) stated that they work more than 10 hours per day on certain occasions. In contrast, only 48 individuals (24.2%) of the symptomatic group do not work these extended hours. This high concentration suggests that prolonged daily shifts are a major contributing factor to physical strain, as three out of every four affected workers are subjected to these long work periods.

When compared to the general study population, where 180 individuals reported working more than 10 hours, the data shows a high prevalence rate within this specific group.

Specifically, 83.3% of all healthcare workers who work these extended shifts (150 out of 180) suffer from musculoskeletal disorders. This highlights that staying on duty for more than 10 hours significantly increases the likelihood of developing physical ailments, likely due to cumulative fatigue and the lack of adequate rest between demanding tasks.

Table 11:Distribution of the Affected Population by Exposure to Shifts Exceeding 10 Hours

Working at Least One 10-Hour Shift per Week	Number of Cases	Percentage (%)
Yes	150	75.8%
No	48	24.2%
Total	**198**	**100%**

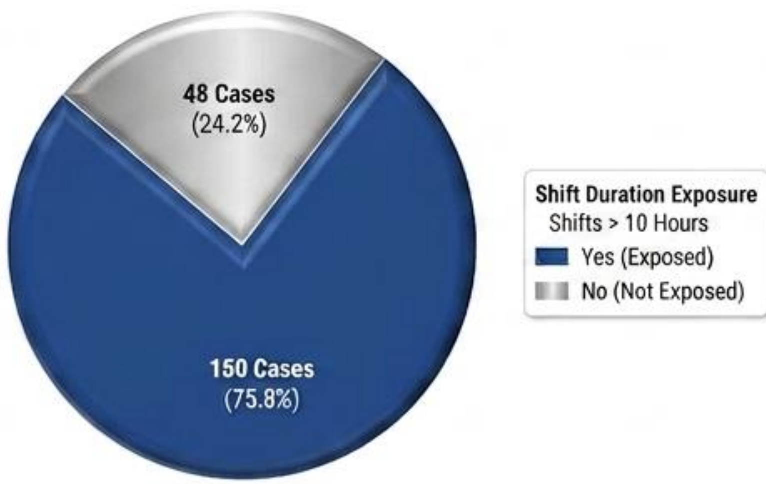

Figure 22:Distribution of the Affected Population by Exposure to Shifts Exceeding 10 Hours

1.5. Anatomical Localization of Reported Musculoskeletal Disorders Identified via the Nordic Questionnaire

The Nordic Musculoskeletal Questionnaire revealed a high prevalence of musculoskeletal complaints across multiple body regions among the study population (n = 248). The findings indicate that musculoskeletal disorders were widely distributed, with several anatomical sites reporting notably elevated prevalence rates.

The low back (lumbar region) emerged as the most affected site, with 168 participants reporting complaints, corresponding to a prevalence of 84.8%. This was followed by the neck (n = 98, 49.5%) and shoulders (n = 90, 45.5%), both of which affected nearly half of the population. The upper back and ankles/feet showed equal prevalence rates of 42.4% (n = 84 each), placing them among the moderately affected regions. Knees were reported by 70 participants (35.4%), while wrists/hands accounted for 24.2% of complaints (n = 48). The least affected regions were the hips/thighs (n = 40, 20.2%) and elbows (n = 18, 9.1%).

These results suggest a predominance of axial and proximal musculoskeletal complaints, particularly involving the spinal column and upper limbs, which is consistent with patterns commonly reported in occupational health literature among workers exposed to prolonged static postures, repetitive movements, or physically demanding tasks.

The striking prevalence of low back pain (84.8%) is particularly noteworthy and may reflect prolonged sitting or standing postures, manual handling, or insufficient ergonomic support in the workplace. Similarly, the high rates observed in the neck (49.5%) and shoulders (45.5%) suggest significant upper body strain, potentially associated with awkward postures or repetitive upper limb activity during work tasks.

The relatively lower prevalence in the elbows (9.1%) and hips/thighs (20.2%) may indicate that these regions are less directly solicited by the occupational demands of the studied population, or alternatively, that complaints in these areas are underreported due to their perceived lower impact on work capacity.

Overall, the distribution of musculoskeletal disorders follows a pattern that strongly implicates **occupational exposure** as a contributing factor, with the lumbar spine, neck, and shoulders representing priority areas for ergonomic intervention and preventive strategies in the workplace.

Table 12:Distribution of Musculoskeletal Disorders by Anatomical Region and Prevalence Rates

Anatomical Region	Number of Cases	Prevalence (%)
Neck	**98**	**49.5%**
Shoulders	**90**	**45.5%**
Elbows	**18**	**9.1%**
Wrists / Hands	**48**	**24.2%**
Upper Back	**84**	**42.4%**
Low Back (Lumbar)	**168**	**84.8%**
Hips / Thighs	**40**	**20.2%**
Knees	**70**	**35.4%**
Ankles / Feet	**84**	**42.4%**

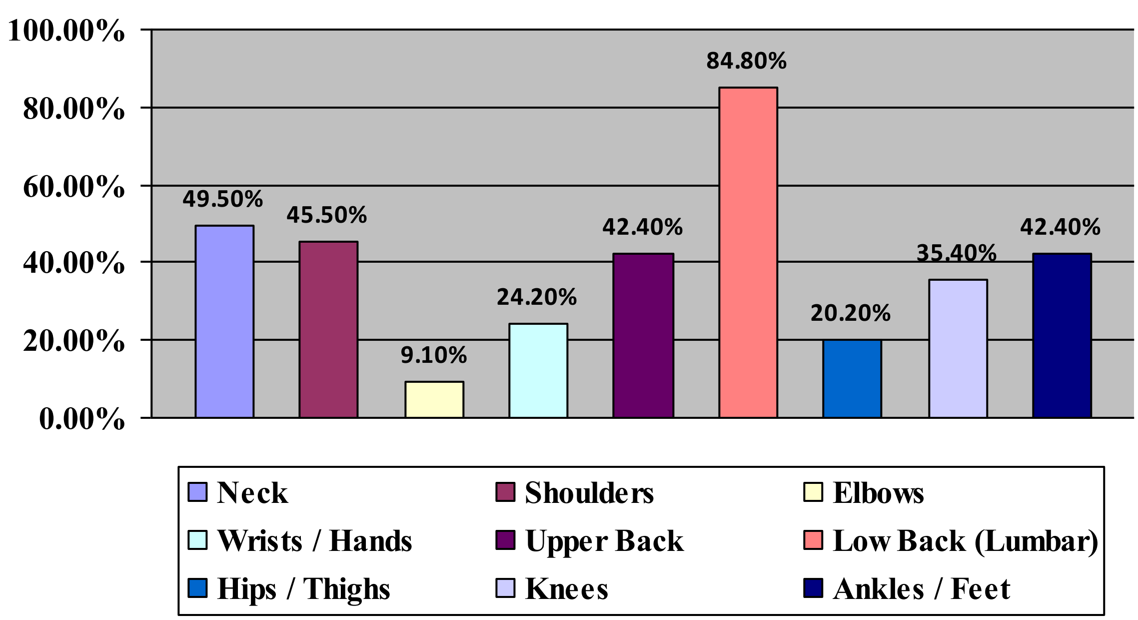

Figure 23:Distribution of Musculoskeletal Disorders by Anatomical Region and Prevalence Rates

1.6. Co-occurrence of MSD Lesions within the Affected Population

The survey results regarding the complexity of musculoskeletal issues highlight that a vast majority of the symptomatic population suffers from pain in multiple areas of the body. Specifically, 77.5% of the affected healthcare workers report Multi-level involvement .In contrast, only 22.5% of the group reports Single-region involvement. This high rate of co-occurrence suggests that the physical demands of healthcare work are rarely localized

Table 13 : Co-occurrence of MSD Lesions within the Affected Population

Type of MSD Lesion Involvement	Number of Cases	Percentage (%)
Multi-level Involvement	153	77.5%
Single-region Involvement	45	22.5%
Total	**198**	**100%**

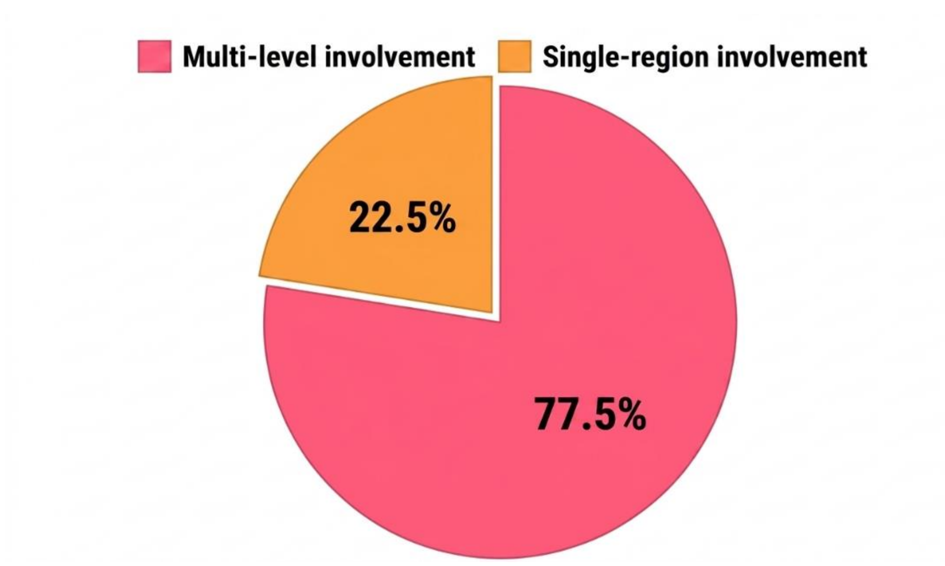

Figure 24: Co-occurrence of MSD Lesions within the Affected Population

DISCUSSION

1. Prevalence of WMSDs among healthcare personnel

1.1. Prevalence of WMSDs in the affected population

The results of our study highlight a high prevalence of Work-related Musculoskeletal Disorders (WMSDs) among the healthcare staff at the EPH of Laghouat. Out of the total participants, 79.8% reported experiencing at least one musculoskeletal symptom. This high frequency confirms that our target population is particularly exposed to ergonomic risks inherent to hospital activities.

These results are concordant with current epidemiological trends observed in various international hospital settings; for instance, high prevalence rates have been documented in several international contexts, ranging from 89.2% in Morocco (63) and 91.2% in China (64). Even where the frequency is slightly lower—such as the 83.7% reported among nursing staff in Egypt (65), 74.7% in Vietnam (66) and 72.4% reported among healthcare workers in Saudi Arabia (67), the data consistently points toward a significant occupational health burden across diverse healthcare systems.

Table 14:Comparison of WMSDs Prevalence Rates Across International Healthcare Settings

Location (Study Reference)	**Prevalence Rate (%)**
EPH Laghouat, Algeria (Present Study)	79.8%
Morocco	89.2%
Egypt	83.7%
China	91.2%
Vietnam	74.7%
Saudi Arabia	72.4%

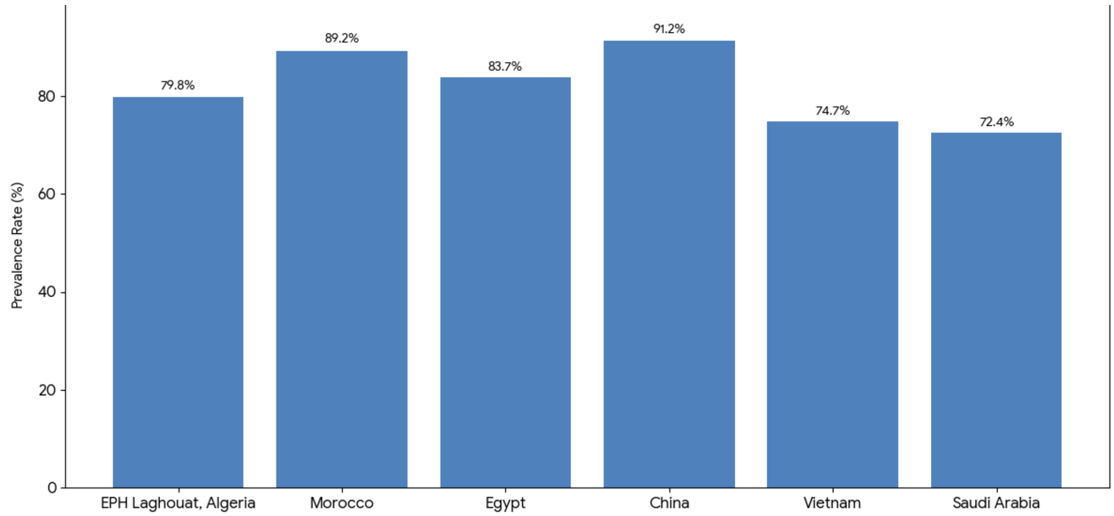

Figure 25:Comparison of WMSDs Prevalence Rates Across International Healthcare Settings

1.2. Multi-site involvement and association of WMSD locations

Regarding the distribution of musculoskeletal lesions, our study reveals a predominant trend toward multi-regional involvement among the healthcare personnel at the EPH of Laghouat. Specifically, 77.5% of symptomatic participants reported pain in multiple anatomical sites, while only 22.5% experienced symptoms localized to a single region, This pattern aligns with global observations where WMSDs typically manifest as generalized rather than isolated conditions; for instance, a study conducted in Melbourne, Australia, reported that 52% of their total study population of healthcare workers suffered from multi-regional involvement, with a higher proportion 19% maintaining pain at a single site (68). Overall, these findings reinforce the concept that work-related musculoskeletal disorders among healthcare workers frequently manifest as multi-regional conditions rather than isolated complaints, highlighting the need for comprehensive preventive strategies targeting multiple body regions simultaneously

2. General Characteristics of the Affected Personnel

2.1. Age

The descriptive analysis of our population reveals a mean age of 34.7 ± 8.9 years, with a predominant concentration of cases in the 31–40 age bracket. This average indicates a young and professionally active workforce, which is a finding highly consistent with contemporary international literature.

Our results align closely with studies conducted in similar healthcare environments; specifically, our mean age of 34.7 years is concordant with findings from Saudi Arabia (35.28 ± 8.6 years) (67), and Thailand (33.9 ± 9.5 years)(69). Furthermore, the youthful profile of our symptomatic personnel mirrors trends observed in China (33.8 ± 8.6 years) (64), Vietnam (32.6 ± 7.7 years) (66), and India (32.5 ± 8.1 years) (70).

Table 15: Comparison of Mean Age (±SD) of Affected Healthcare Workers Across Study Sites

Country	Our Study	Saudi Arabia	Thailand	China	Vietnam	India
Mean Age ± Standard Deviation (years)	34.7 ± 8.9	35.28 ± 8.6	33.9 ± 9.5	33.8 ± 8.6	32.6 ± 7.7	32.5 ±8.1

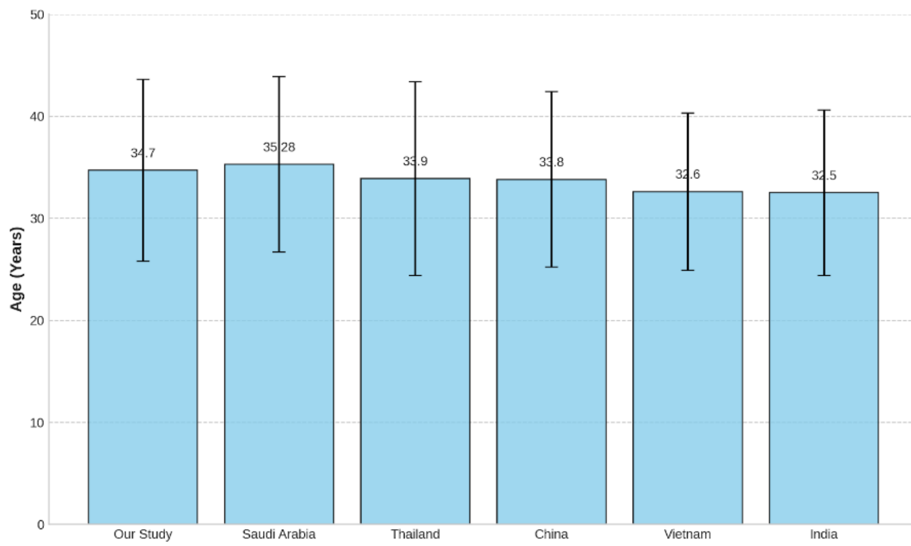

Figure 26:Comparison of Mean Age (±SD) of Affected Healthcare Workers Across Study Sites

2.2. Gender

Regarding the gender distribution of the affected personnel, our study reveals feminine predominance, with 62.8% of symptomatic cases occurring in females. This trend is widely supported by international literature, which frequently identifies female healthcare workers as a high-risk group for WMSDs.

Our results are highly consistent with findings in China, where 63.6% of affected professionals were female (64) , and in India, where a similar prevalence of 59% was reported (71) . Within the Maghreb region, our findings are concordant with a study conducted in Tunisia, which also showed a feminine predominance of 55.9% (72). While our data shows a more balanced distribution than that of Vietnam, which reported a massive 81.3% female predominance (66), it stands in contrast to results from Saudi Arabia, where females accounted for only 45.8% of cases (67).

Table 16:Comparison of Gender Distribution Among Affected Healthcare Workers Across International Studies

Study Location	Female Prevalence (%)	Male Prevalence (%)
Our study (Algeria)	62.8%	37.2%
China	63.6%	36.4%
India	59%	41.0%
Vietnam	81.3%	18.7%
Saudi Arabia	45.8%	54.2%
Tunisia	55.9%	44.1%

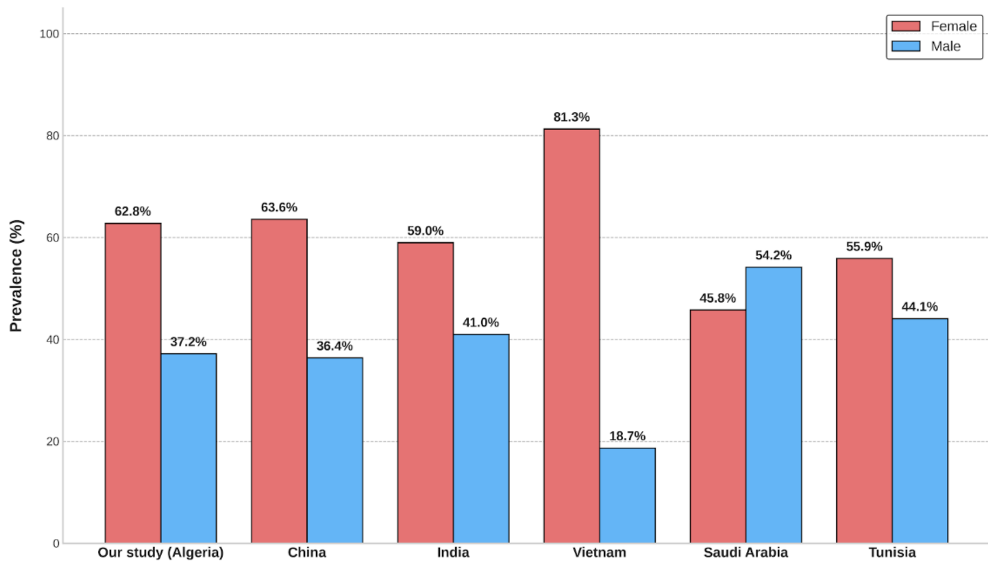

Figure 27:Comparison of Gender Distribution Among Affected Healthcare Workers Across International Studies

2.3. Body Mass Index

The analysis of the Body Mass Index (BMI) among healthcare professionals suffering from musculoskeletal disorders (MSDs) at EPH Laghouat reveals a varied distribution. In our study, while the majority of symptomatic workers maintain a normal weight (62.4%), a significant proportion of 25.8% are overweight and 3.2% are obese.

Comparing these results with international literature highlights distinct disparities. Our overweight prevalence (25.8%) is notably higher than that reported in India (16.9%), identifying weight as a more prevalent risk factor in our local context (73). However, this profile remains more favorable than in Saudi Arabia, where an overwhelming majority of 71.22% of the staff are overweight or obese, compared to only 28.78% with a normal BMI (67). Regionally, our data aligns with Tunisia, where a mean BMI of 25.8 ± 4.54 kg/m² places the average healthcare professional just above the normal threshold (72).

2.4. Job Category

The distribution of MSDs across professional categories at the EPH of Laghouat reveals a high burden of morbidity across all clinical roles. Nursing Staff exhibit the highest prevalence at 88.5%, followed by Surgeons 80.0% and Non-surgical Physicians 73.9%, while Technicians report a lower but still significant prevalence of 40.0%.

Our results regarding nursing staff are consistent with international findings, such as those in Saudi Arabia 81.57% and Bangladesh 77.6%, where nurses consistently emerge as the most affected group due to the physical intensity of bedside care. However, our findings for medical staff show a marked departure from some international averages. While the 61.3% prevalence among doctors in Bangladesh and 65.56% in Saudi Arabia are high, they remain lower than the combined prevalence of 75.9% observed among doctors in our study (67) (74) .

A critical regional comparison is found in Morocco, where the data mirrors the high prevalence seen at Laghouat. Interestingly, the Moroccan study reported a prevalence of 84.0% for nursing staff, 89.13% for non-surgical physicians and 82.82% for surgeons. While our study shows a slightly higher risk for surgeons compared to non-surgical staff, both our results and the Moroccan data confirm a significantly higher professional risk for medical doctors in North African hospital settings compared to those in Asian or Gulf contexts. This disparity suggests that factors such as hospital infrastructure, patient-to-doctor ratios, and the lack of ergonomic support systems in the region may contribute to these elevated rates (63). Furthermore, the 40.0% prevalence among our technicians—though lower than our clinical staff—is notably lower than the 61.02% reported in Saudi Arabia (67), possibly reflecting differences in the automation of technical tasks or equipment handling between the two environments.

Table 17:Comparison of WMSDs Prevalence Rates by Professional Category Across Study Sites

<table>
<tr><th>Study Location</th><th>Nurses (%)</th><th>Surgeons (%)</th><th>Non-Surg Physicians (%)</th><th>Technicians (%)</th></tr>
<tr><td>EPH Laghouat</td><td>88.5%</td><td>80.0%</td><td>73.9%</td><td>40.0%</td></tr>
<tr><td>Morocco</td><td>84.0%</td><td>82.82%</td><td>89.13%</td><td>_</td></tr>
<tr><td>Saudi Arabia</td><td>81.57%</td><td colspan="2">65.56%</td><td>61.02%</td></tr>
<tr><td>Bangladesh</td><td>77.6%</td><td colspan="2">61.3%</td><td>_</td></tr>
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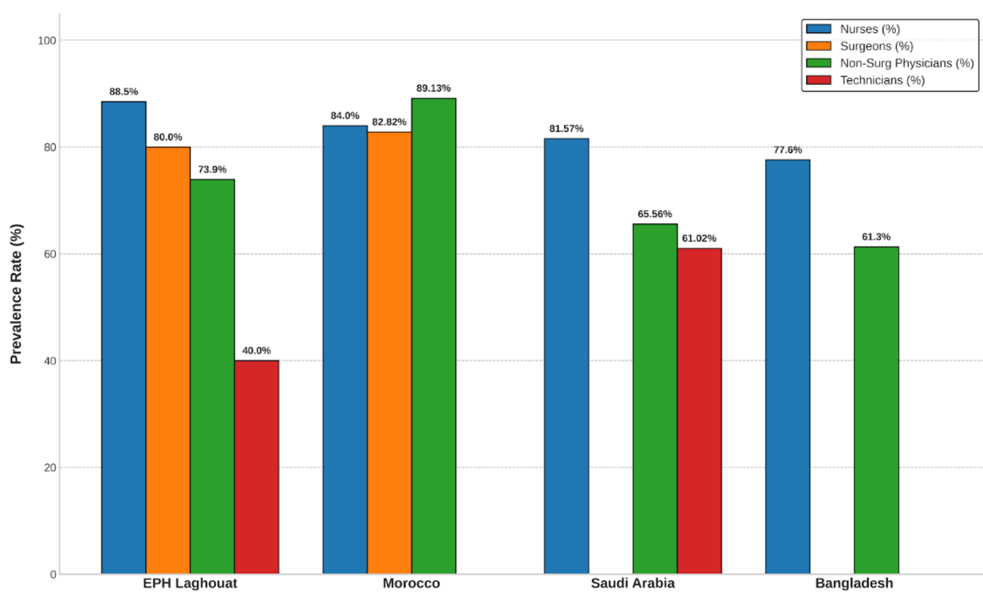


Figure 28:Comparison of WMSDs Prevalence Rates by Professional Category Across Study Sites

2.5. Professional Seniority

Our analysis of professional seniority reveals a deeply concerning trend at EPH Laghouat: an almost immediate onset of musculoskeletal symptoms followed by total saturation in long-term staff. We found an alarmingly high prevalence of 83.33% among those with less than 5 years of service. This 'early-career shock' far exceeds rates seen in India (44.62%) or

Saudi Arabia (70.59%) (67,73), suggesting that our work environment imposes an aggressive physical toll on new recruits from day one.

Most notably, our study identifies a 100% prevalence rate for staff in the 21–30-year seniority bracket. This indicates that at our facility, two decades of clinical service results in a near-certainty of developing an MSD. This finding directly contradicts the trend observed in Morocco, where prevalence reportedly dropped to 29.9% after 10 years of service (63). The staff at EPH Laghouat appears to face a continuous, cumulative biomechanical load that worsens over time.

Table 18:Comparison of WMSDs Prevalence Rates by Professional Seniority Across International Studies

Study Location	Early Career	Mid-Career	Advanced Career	Late Career
EPH Laghouat	< 5y: 83.33%	5–10y: 69.88%	11–30y: 83.72% - 100%	> 30y: 88.89%
India	< 5y: 44.62%	5–10y: 48.57%	10–15y: 66.67%	> 15y: 60.0%
Saudi Arabia	< 5y: 70.59%	6–14y: 73.14%	> 15y: 73.97%	–
Morocco	< 10y: 70.09%	> 10y: 29.9%	–	–

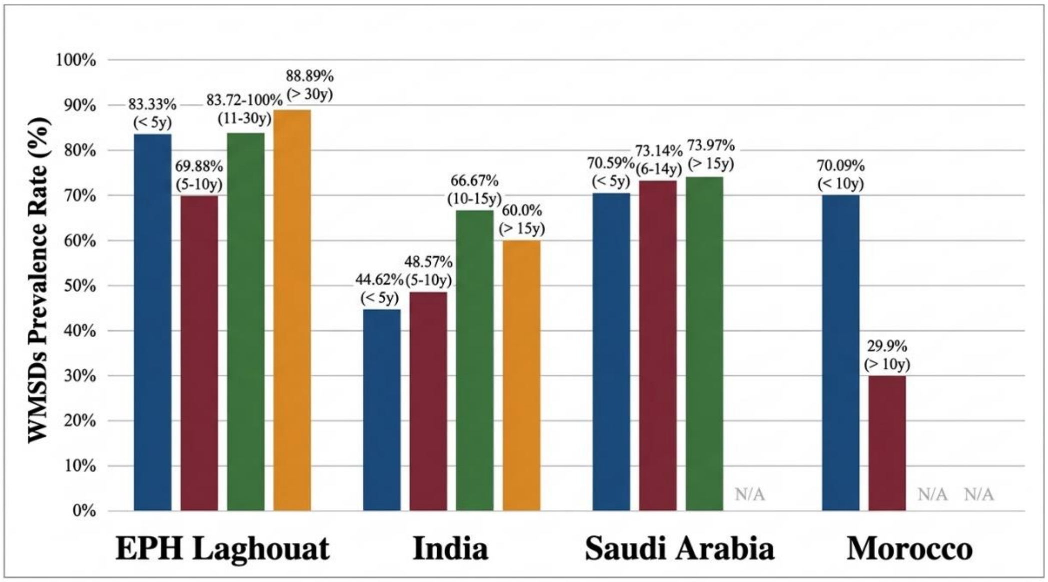


Figure 29:Comparison of WMSDs Prevalence Rates by Professional Seniority Across International Studies

3. Temporal Work Characteristics of the Affected Population

3.1. Weekly Workload

The distribution of weekly working hours among the symptomatic population at EPH Laghouat reveals a clear correlation between prolonged occupational exposure and the prevalence of MSDs. According to our results, 56.3% of affected staff work between 30 and 40 hours per week, while 34.4% exceed 40 hours. Only a small minority 9.4% of those affected work fewer than 30 hours.

This high prevalence among staff working over 30 hours is consistent with international literature, which identifies long working hours as a major biomechanical stressor to develop WMSDs. This data is strongly supported by recent findings in Syria, where a similar 'dose-response' relationship was observed among the affected population. In the Syrian study, the vast majority of symptomatic healthcare workers were found in the higher workload brackets: 1,013 cases (64.2%) reported working more than 30 hours per week, while only 123 cases (7.8%) worked between 20-25 hours (75).

Both studies suggest that the 30-hour mark represents a critical threshold for musculoskeletal health in regional hospital settings. At EPH Laghouat, the high concentration of symptoms in full-time staff suggests that the intensity of clinical tasks—combined with a lack of ergonomic recovery time leads to a state of chronic physical exhaustion. This regional trend across Algeria and Syria reinforces the conclusion that current hospital working hours are a primary driver of occupational morbidity.

4. Topographical Distribution of Musculoskeletal Symptoms

4.1. The Dominance of Axial Biomechanical Strain

The topographical analysis of our symptomatic population reveals that the lumbar spine is by far the most vulnerable anatomical region, affecting 84.8% of symptomatic personnel at EPH Laghouat-Algeria. When compared internationally, our data perfectly aligns with the epidemiological profile of Tunisia (87.27%) and Nigeria (79.8%), indicating a shared biomechanical reality in regional and continental healthcare systems (72,76).

For the medical staff, this high prevalence is driven by two distinct mechanisms. Surgeons and physicians experience isometric strain due to prolonged static orthostatism—maintaining a fixed, slightly flexed posture for hours over an operating table or during clinical examinations. Conversely, for the nursing staff, the load is dynamic, primarily resulting from manual patient transfers and repetitive trunk flexion (77). However, a stark contrast is observed when comparing our results to Saudi Arabia (67) , where lumbar prevalence is strictly lower (42.09%). This significant divergence can likely be explained by differences in hospital infrastructure and ergonomics.

4.2. The Cervico-Scapular Axis

The secondary zones of morbidity at EPH Laghouat are the Neck (49.5%) and the Shoulders (45.5%). These figures place our hospital in the exact same epidemiological bracket as Morocco (Neck: 54.2%, Shoulders: 50%) (63) and Saudi Arabia (Neck: 52.88%, Shoulders: 47.48%) (67).

This transnational consistency confirms that cervicobrachial pain is a universal consequence of clinical practice. It is driven by the necessity of maintaining "dropped-head" (cervical flexion) and arms-elevated postures during precision medical tasks (78). The fact that our study mirrors both regional (Morocco) and high-income (Saudi Arabia) hospital systems in this specific area proves that while heavy lifting can be solved with equipment, the static postural strain of direct patient care remains a universal hazard.

4.3. Upper Back and Lower Extremities

The most unique and clinically concerning finding of our study is the unusually high prevalence of pain in the Upper Back (42.4%) and the Ankles/Feet (42.4%).

When compared to the other cohorts, the staff at EPH Laghouat suffers from ankle and foot pain at a rate more than double that of Tunisia (17%) and quadruple that of Nigeria (10.7%). Similarly, upper back pain at our facility (42.4%) vastly exceeds the rates in Tunisia (7.07%) and Saudi Arabia (26.26%) (67,72,76).

From an occupational health perspective, this specific topographical combination—upper back fatigue combined with severe ankle/foot pain—is the clinical signature of prolonged, unrelieved static standing. It strongly suggests that healthcare workers at EPH Laghouat spend excessive consecutive hours standing on hard surfaces during long shifts, without access to adequate ergonomic footwear, anti-fatigue flooring, or sufficient sitting breaks. This continuous gravitational loading leads to vascular pooling in the lower extremities and chronic fatigue in the thoracic spinal erectors.

Ultimately, the topographical mapping of MSDs at EPH Laghouat describes a workforce under total-body strain. While the high lumbar and cervical rates match regional norms, the exceptional rates of distal extremity pain (feet/ankles) highlight a severe local deficit in temporal work organization and physical recovery periods

Table 19: Comparison of Anatomical Distribution of Musculoskeletal Disorders Across International Studies

Anatomical Region	EPH Laghouat	Morocco	Tunisia	Saudi Arabia	Nigeria
Neck	49.5%	54.2%	38.16%	52.88%	41.2%
Shoulders	45.5%	50%	28.97%	47.48%	45.4%
Elbows	9.1%	20.8%	10.6%	33.09%	5.3%
Wrists / Hands	24.2%	36.7%	27.9%	35.61%	25.2%
Upper Back	42.4%	30.8%	7.07%	26.26%	33.2%
Low Back (Lumbar)	84.8%	63.3%	87.27%	42.09%	79.8%
Hips / Thighs	20.2%	21.7%	14.48%	25.54%	16%
Knees	35.4%	36.7%	31.09%	33.45%	38.9%
Ankles / Feet	42.4%	32.5%	17%	32.37%	10.7%

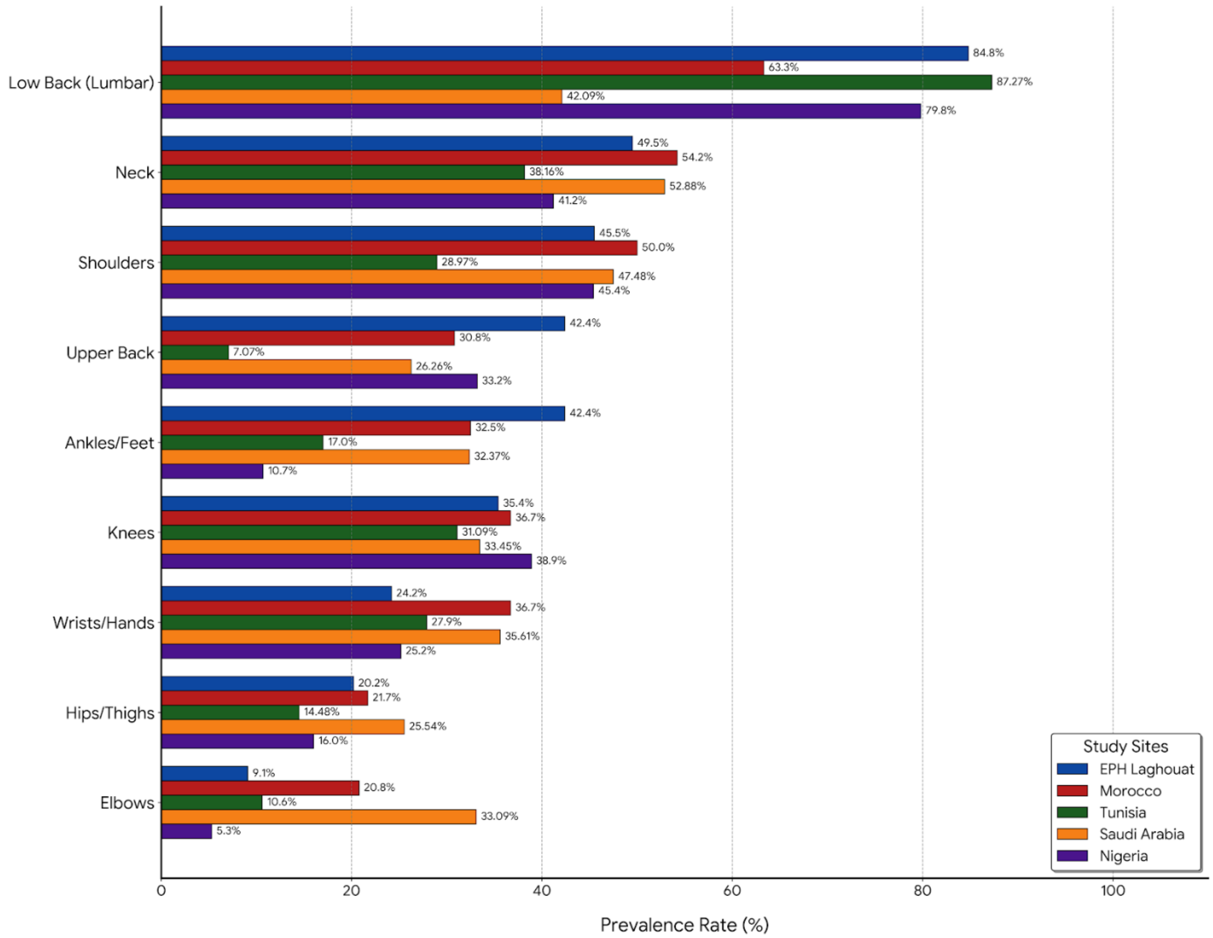


Figure 30 :Comparison of Anatomical Distribution of Musculoskeletal Disorders Across International Studies

RECOMMENDATIONS

Given the exceptionally high prevalence of WMSDs—particularly in the lumbar region (84.8%) and lower extremities—and their significant medical and socio-professional consequences, the following measures are recommended:

1. Institutional Education and Prevention Programs

- Implementation of compulsory educational programs focused on the prevention of WMSDs and adaptive physical strategies. These should be specifically designed for each professional category (surgeons, physicians, and nurses) to reduce morbidity and ensure the continued efficiency of patient care.
- Integration of ergonomic training during the initial induction of new staff. This should focus on "precision postures" for surgical teams and "safe handling" techniques for clinical staff.

2. Early Clinical Intervention and Awareness

- Encouraging medical and paramedical staff to treat even minor musculoskeletal discomfort as a significant clinical sign. Early reporting is essential to prevent the progression from acute fatigue to chronic, disabling pathologies.
- Strengthening the role of the occupational medicine department for early diagnosis and rapid management of symptoms, thereby avoiding heavy medical complications and long-term professional disability.

3. Optimization of Working Conditions and Organization

- Spacing out night shifts to allow for sufficient physiological recovery, particularly for the surgical and emergency teams who face long hours of static standing.

- Given the high morbidity in the >40-hour bracket, hospital management should aim to limit consecutive high-intensity clinical shifts to prevent the "fatigue-failure" threshold of the lumbar spine.

Study Limitations

- Encountering non-cooperation or reluctance from certain healthcare professionals during the data collection phase.
- A significant lack of comparative, making international benchmarking difficult for certain sections (specifically on the temporal work characteristics part).
- The majority of existing international literature focuses almost exclusively on nursing staff, resulting in a shortage of data regarding the specific biomechanical risks faced by surgeons, physicians, and technical staff.
- The high volume of qualitative and quantitative data required extensive time and precision for organization, coding, and statistical analysis within SPSS software.

CONCLUSION

This study has highlighted the prevalence of musculoskeletal disorders (WMSDs) among healthcare staff within EPH Laghouat. Upon completion of this research, which utilized the Nordic Musculoskeletal Questionnaire (NMQ) to gather data, it is clear that these pathologies are not isolated incidents but the direct result of prolonged exposure to major biomechanical and organizational constraints inherent in the hospital environment.

The analysis of our study population demonstrates that the health of caregivers is severely tested by a synergy of factors, notably high weekly workloads and the maintenance of prolonged static postures during medical and surgical procedures. These constraints often exceed the body's natural physiological recovery capacity, leading to chronic muscle fatigue. This is evidenced by the critical prevalence of symptoms identified in our cohort, particularly the 84.8% prevalence of lumbar pain and 49.5% prevalence of neck pain. These figures underscore a physical toll that affects the entire multidisciplinary team, from surgeons to paramedical staff.

The issues raised by this work are twofold. On one hand, it emphasizes the urgent need to move beyond a purely curative vision and adopt a preventative ergonomic approach. On the other hand, it challenges institutional management on the importance of protecting the hospital's human capital. Improving working conditions, providing ergonomic equipment, and promoting early awareness are not luxuries but indispensable investments to ensure the sustainability of care and the safety of practitioners.

The prevention of WMSDs must become an occupational health priority within our establishment. Protecting those who provide care is the primary condition for ensuring the quality of patient management. We hope that the reflections and recommendations derived from this work will serve as a foundation for a genuine, long-term prevention strategy at EPH Laghouat.

APPENDIX

HEALTH ASSESSMENT FORM

Nordic Musculoskeletal Questionnaire

1 PERSONAL AND PROFESSIONAL INFORMATION

AGE

WEIGHT (KG)

Gender: ☐ Male ☐ Female

Current Job:

Department:

Duration of work: Years: Months:

2 HEALTH AND WORK SCHEDULE

Do you have any chronic immune diseases? ☐ Yes ☐ No

If yes, specify:

Are you suffering from symptoms related to previous injuries? ☐ Yes ☐ No

If yes, specify:

Work Schedule: ☐ Regular ☐ Variable

Work Shift: ☐ Day ☐ Evening ☐ Night ☐ Rotation

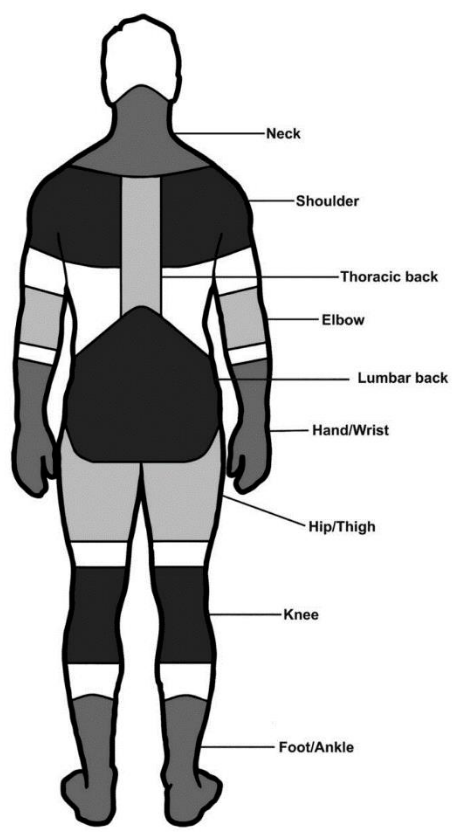
Days worked per week: ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7

Hours worked per week:

Does your work exceed 10 hours per day? ☐ Yes ☐ No

3 MUSCULOSKELETAL SYMPTOMS QUESTIONNAIRE

Body Part	(1) Trouble in last 12 months (Ache, pain, discomfort) □ Yes / □ No	(2) Prevented from work (home or outside) in last 12 months □ Yes / □ No	(3) Trouble in last 7 days □ Yes / □ No	(4) Pain rating on a scale of 10 (0 = No pain, 10 = Severe)
Neck	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	______
Shoulder (Right)	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	______
Shoulder (Left)	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	______
Elbows / Forearms	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	______
Wrist / Hands	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	______
Upper Back	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	______
Lower Back (Lumbar)	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	______
Hips / Thighs	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	______
Knees	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	______
Ankles / Feet	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	______



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ABSTRACT

Background: Work-related musculoskeletal disorders (WMSDs) represent a major occupational health challenge in healthcare settings worldwide. Healthcare professionals are particularly vulnerable due to the physically demanding nature of their work, including patient handling, prolonged standing, repetitive movements, and exposure to awkward postures. In Algeria, WMSDs remain underrecognized as an occupational health concern, with limited data available on their prevalence among hospital staff.

Objectives: The aim of this study was to assess the prevalence of musculoskeletal disorders among healthcare professionals at the Colonel Lotfi Hospital of Laghouat, and to analyze their distribution according to sociodemographic characteristics, occupational factors, and anatomical localization.

Methods: An observational, descriptive, cross-sectional epidemiological study was conducted from January to April 2026 across all departments of the EPH of Laghouat. A total of 248 (HCWs) including physicians, surgeons, nurses, and technicians — were surveyed using a structured self-administered questionnaire incorporating the Nordic Musculoskeletal Questionnaire (NMQ). Sociodemographic, anthropometric, and occupational data were collected and analyzed using Microsoft Excel.

Results: The overall prevalence of WMSDs was 79.8% (n = 198), affecting nearly four out of five healthcare workers surveyed. The sample was predominantly female (56.6%) with a median age of 34 years. Nurses constituted the most affected professional category, with a prevalence rate of 88.5%, followed by surgeons (80%) and non-surgical physicians (73.9%). Among the affected population, 77.5% presented with multi-site involvement. The low back (lumbar region) was the most frequently reported anatomical site (84.8%), followed by the neck (49.5%) and shoulders (45.5%). Temporal work factors were strongly associated with symptom burden: 75.8% of affected workers reported working shifts exceeding 10 hours, and over 90% worked more than 30 hours per week. Workers with more than 21 years of professional seniority showed the highest prevalence rates (100% and 88.8% for the 21–30 and >30 years groups, respectively).

Conclusion: This study reveals a high and concerning prevalence of WMSDs among healthcare professionals at EPH Laghouat, consistent with international data from comparable healthcare settings. The results highlight the urgent need for targeted ergonomic interventions, institutional prevention programs, and systematic occupational health monitoring within Algerian hospitals.

Keywords: *musculoskeletal disorders, healthcare workers, occupational health, Nordic questionnaire, prevalence, Algeria.*

الملخص

خلفية الدراسة :تمثل الاضطرابات العضلية الهيكلية المرتبطة بالعمل (WMSDs) تحدياً كبيراً للصحة المهنية في مرافق الرعاية الصحية على مستوى العالم. ويُعد المتخصصون في الرعاية الصحية فئة معرضة للخطر بشكل خاص نظراً للطبيعة الشاقة بدنياً لعملهم، بما في ذلك نقل المرضى، والوقوف لفترات طويلة، والحركات المتكررة، والتعرض لوضعيات جسدية غير مريحة. وفي الجزائر، لا تزال هذه الاضطرابات غير معترف بها ككفاية كمشكلة صحية مهنية، مع وجود بيانات محدودة حول مدى انتشارها بين طواقم المستشفيات.

الأهداف :هدفت هذه الدراسة إلى تقييم مدى انتشار الاضطرابات العضلية الهيكلية بين مهنيي الصحة في المؤسسة العمومية الاستشفائية (EPH) المختلطة بسعة 240 سرير في الأغواط، وتحليل توزيعها حسب الخصائص السوسيو-ديموغرافية، والعوامل المهنية، والتمركز التشريحي للألم.

المنهجية :أُجريت دراسة وبائية وصفية مقطعية في الفترة ما بين جانفي وأفريل 2026 شملت جميع أقسام المؤسسة العمومية الاستشفائية بالأغواط. تم مسح ما مجموعه 248 عاملاً في قطاع الصحة — بما في ذلك الأطباء والجراحين والممرضين والتقنيين — باستخدام استبيان منظم ذاتي الإدارة يتضمن استبيان نورديك للمشاكل العضلية الهيكلية .(NMQ) تم جمع البيانات السوسيو-ديموغرافية، والأنثروبومترية، والمهنية وتحليلها باستخدام برنامج.Microsoft Excel

النتائج :بلغ معدل الانتشار الإجمالي للاضطرابات العضلية الهيكلية المرتبطة بالعمل 79.8% (ن = 198)، مما يؤثر على ما يقرب من أربعة من كل خمسة عمال صحيين شملهم المسح. كانت العينة في الغالب من الإناث (56.6%) بمتوسط عمر 34 عاماً. وشكل الممرضون الفئة المهنية الأكثر تضرراً بمعدل انتشار قدره 88.5%، يليهم الجراحون (80%) ثم الأطباء غير الجراحين (73.9%). ومن بين السكان المتضررين، أظهر 77.5% إصابات في مواقع متعددة من الجسم. كانت أسفل الظهر (المنطقة القطنية) هي الموقع التشريحي الأكثر إبلاغاً عنه (84.8%)، تليها الرقبة (49.5%) والكتفين (45.5%). ارتبطت عوامل وقت العمل بقوة بعبء الأعراض؛ حيث أفاد 75.8% من العمال المصابين بالعمل في نوبات تزيد عن 10 ساعات، وأكثر من 90% عملوا لأكثر من 30 ساعة في الأسبوع. كما أظهر العمال الذين تزيد أقدميتهم المهنية عن 21 عاماً أعلى معدلات انتشار (100% و88.8% للمجموعتين "21-30 عاماً" و "أكثر من 30 عاماً" على التوالي).

الاستنتاج :تكشف هذه الدراسة عن انتشار مرتفع ومقلق للاضطرابات العضلية الهيكلية بين مهنيي الصحة في المؤسسة العمومية الاستشفائية بالأغواط، وهو ما يتوافق مع البيانات الدولية من بيئات رعاية صحية مماثلة. تسلط النتائج الضوء على الحاجة الملحة لتدخلات أرغونومية (هندسية بشرية) هادفة، وبرامج وقاية مؤسساتية، ومراقبة دورية للصحة المهنية داخل المستشفيات الجزائرية.

الكلمات المفتاحية :الاضطرابات العضلية الهيكلية ,عمال الرعاية الصحية، الأرغونوميا، الصحة المهنية، استبيان نورديك، الأغواط، الجزائر.

Résumé

Contexte : Les TMS liés au travail constituent un problème majeur de santé au travail dans les établissements de soins. Les professionnels de santé sont particulièrement exposés en raison de la pénibilité physique de leur activité, incluant la manutention des patients, la station debout prolongée et les gestes répétitifs. En Algérie, les TMS demeurent insuffisamment reconnus comme pathologies professionnelles, et les données relatives à leur prévalence en milieu hospitalier restent rares.

Objectifs : L'objectif de cette étude est d'évaluer la prévalence des troubles musculo-squelettiques chez les professionnels de santé exerçant à l'établissement public hospitalier (EPH) de Laghouat, d'une capacité de 240 lits, et d'analyser leur distribution selon les caractéristiques sociodémographiques, les facteurs professionnels et la localisation anatomique.

Méthodes : Une étude épidémiologique observationnelle descriptive transversale a été menée de janvier à avril 2026 dans l'ensemble des services de l'EPH de Laghouat. Au total, 248 professionnels de santé médecins, chirurgiens, infirmiers et techniciens — ont été inclus. Les données ont été recueillies à l'aide d'un questionnaire structuré auto-administré comprenant le Questionnaire Nordique sur les Troubles Musculo-Squelettiques (NMQ). L'analyse statistique a été réalisée sous Microsoft Excel.

Résultats : La prévalence globale des TMS était de 79,8 % (n = 198), touchant près de quatre professionnels de santé sur cinq. L'échantillon était majoritairement féminin (56,6 %) avec un âge médian de 34 ans. Les infirmiers représentaient la catégorie professionnelle la plus affectée avec un taux de 88,5 %, suivis des chirurgiens (80 %) et des médecins non chirurgicaux (73,9 %). Parmi les cas détectés, 77,5 % présentaient une atteinte multi-sites. La région lombaire constituait le site anatomique le plus fréquemment atteint (84,8 %), suivie du rachis cervical (49,5 %) et des épaules (45,5 %). Les contraintes temporelles de travail étaient fortement associées à la charge symptomatique : 75,8 % des travailleurs affectés effectuaient des gardes supérieures à 10 heures, et plus de 90 % travaillaient plus de 30 heures par semaine. Les travailleurs cumulant plus de 21 ans d'ancienneté présentaient les taux de prévalence les plus élevés (100 % et 88,8 % respectivement pour les tranches 21–30 ans et >30 ans .

Conclusion : Cette étude met en évidence une prévalence élevée des TMS chez les professionnels de santé de l'EPH de Laghouat, cohérente avec les données internationales issues de contextes hospitaliers comparables. Ces résultats soulignent la nécessité urgente de mettre en place des interventions ergonomiques ciblées, des programmes institutionnels de prévention et un suivi systématique de la santé au travail au sein des hôpitaux algériens.

Mots-clés : *troubles musculo-squelettiques, professionnels de santé, santé au travail, questionnaire nordique, prévalence, Algérie.*