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ORIGINAL ARTICLE

Musculoskeletal disorders in nursing staff: analysis of the effect of forced postures

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ABSTRACT

Introduction: nursing staff are exposed to forced postures during healthcare delivery, which increases the risk of musculoskeletal disorders affecting their health and work performance.
Objective: to analyze the effect of forced postures on musculoskeletal health in nursing staff.
Methods: an observational, descriptive, cross-sectional study was conducted with an intentional sample of 50 nursing professionals from Health District 18D04, Tungurahua, identifying ergonomic risks and their relationship with the occurrence of symptoms. The standardized Nordic questionnaire was applied to assess musculoskeletal symptoms in different body regions. Descriptive and inferential statistical methods were employed, respecting bioethical principles.
Results: 80 % of respondents reported discomfort in the dorsolumbar region, 76 % in the neck, and 52 % in the shoulders. Most symptoms appeared chronically, lasting months or years, especially in the lower back and neck. In the last 12 months, 90 % reported recurrent dorsolumbar pain associated with repetitive activities, load handling, and accelerated work pace. The most frequent postures were trunk inclination, knee flexion with unbalanced load, and arm elevation above shoulder level.
Conclusions: the findings confirm a high prevalence of musculoskeletal disorders among nursing staff, linked to forced postures and poor ergonomic conditions. Preventive programs, training in postural hygiene, and organizational measures are required to reduce physical overload, improving quality of life and productivity in the healthcare team.

Keywords: Musculoskeletal Diseases; Postural Balance; Ergonomía; Nursing Staff.

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INTRODUCTION

Globally, forced or inadequate postures represent a significant health problem, with musculoskeletal disorders (MSDs) being the leading cause. A recent analysis of global morbidity burden data estimates that approximately 1,71 billion people worldwide suffer from MSDs. Although prevalence varies by age and diagnosis, these conditions affect individuals of all ages. High-income countries report the highest numbers (441 million), followed by the WHO Western Pacific Region (427 million) and the South-East Asia Region (369 million).[1] According to Cárdenas, [2] the lack of job structuring and exposure to ergonomic hazards have led to a rise in occupational diseases.

As stated by the International Labour Organization (ILO) in 2019, MSDs significantly impact quality of life due to considerable pain and suffering. They also affect the institutions where workers are employed. Approximately 250 million workers are at risk of occupational injuries and diseases. In developing countries, the ILO estimates that the cost of occupational illnesses and accidents ranges between 2 % and 11 % of annual Gross Domestic Product (GDP), making MSDs the leading cause of work-related health issues and absenteeism—reducing enterprise profitability and increasing public social costs by 40 %.[3,4]

Healthcare professionals—including nurses, physicians, and dentists—commonly report discomfort in the cervical, lumbar, and shoulder regions. However, Pincay et al. (2021) note that epidemiological studies in Europe indicate MSDs represent a substantial burden in occupational health, accounting for 25 % of cases due to low back pain and 23% due to myalgia.[5,6,7]

In Nigeria and Great Britain, work-related MSDs predominantly affect nursing staff, particularly in the lumbar region, with a prevalence of 590 cases per 100,000 workers. Similarly, a study among nurses in Buenos Aires, Argentina, revealed physical and mental impairments due to musculoskeletal overload and the cognitive demands required to perform their duties.[8,9]

Low back pain is the primary contributor to the overall burden of MSDs. Other conditions include fractures (436 million people), osteoarthritis (343 million), other injuries (305 million), neck pain (222 million), amputations (175 million), and rheumatoid arthritis (14 million).[10]

In Ecuador, ergonomic risk factors affecting nursing professionals have been identified. 66,6 % of these are attributed to workload overload, repetitive movements, and musculoskeletal pain and discomfort related to physical, mental, and environmental strain, as well as standing for more than 12 hours without rest. Likewise, statistics from the Workers' Risk Insurance of the Ecuadorian Social Security Institute (IESS) indicate that the most frequent diagnoses of occupational diseases are: carpal tunnel syndrome (19,6 %), chronic low back pain with disc herniation (16,1 %), shoulder pain with tendinitis (12,4 %), and disc herniation (10,1 %). Most of these diagnoses involve upper limbs and the spine. Spinal disorders are more common in men (41 %) than in women (23 %), totaling 64 %—making it a major public health concern. [11,12,13]

This context motivated the present study, which aimed to analyze the effect of forced postures on musculoskeletal health among nursing staff.

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METHODS

An observational, descriptive, cross-sectional study was conducted in Health District 18D04, Tungurahua Province, Ecuador—which includes Type A and B health centers and one basic hospital—from January to March 2024.

The reference population consisted of 100 nursing professionals (80 licensed nurses and 20 nursing assistants). Inclusion criteria were active involvement in direct patient care during the study period and voluntary participation. Exclusion criteria included medical leave, vacation, or less than six months of work experience in the district. Sample size was determined using non-probabilistic intentional quota sampling based on accessibility and geographic location. With a 10 % margin of error, the final sample comprised 50 participants (40 licensed nurses and 10 assistants).

Data collection was performed using the standardized Nordic questionnaire, Spanish version adapted by Ibacache (2018). The instrument contained 11 questions; 9 were used as originally designed, 1 was adapted to the local work context, and 1 was excluded for not aligning with study objectives. The questionnaire was self-administered to ensure anonymity and minimize interviewer bias.

Primary variables included the presence of musculoskeletal symptoms in specific body regions (neck, shoulders, wrist/hand, thoracic/lumbar back, arm/elbow/forearm), operationally defined as pain, discomfort, or stiffness in the past 12 months. Secondary variables included symptom duration, frequency, associated ergonomic factors (forced postures, load handling, work pace), and history of treatment received.

Data were recorded in frequency tables and graphs using Microsoft Excel. Statistical analysis was complemented with SPSS software to assess correlations between variables.

Statistical analysis

Descriptive statistics were used to calculate absolute and relative frequencies and measures of central tendency. Inferential analysis employed Pearson's correlation coefficient, with statistical significance set at $p < 0,05$. Missing data were handled by case exclusion, as their proportion was minimal and did not affect result validity. Potential selection bias due to sampling method was mitigated by including professionals from diverse health units and service areas.

Ethical considerations

The study was approved by the Ethics Committee of the Universidad Regional Autónoma de Los Andes. All participants provided informed consent prior to questionnaire administration, ensuring voluntariness and confidentiality. The principles of beneficence, non-maleficence, justice, and autonomy were upheld in accordance with the Declaration of Helsinki and national regulations on human research.

RESULTS

Health District 18D04—spanning from Patate to San Pedro de Pelileo in Tungurahua Province—manages approximately 38 health facilities undergoing operating permit renewals and restructuring. Ten health units were included: 6 Type A centers, 3 Type B centers, and 1 Basic Hospital (BH). The nursing workforce totals 100 professionals, with the highest concentration at Pelileo Basic Hospital, followed by Huambalo Health Center. Most staff work in vaccination clinics,

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outpatient consultation, emergency, and inpatient services—generating higher demand at Type B centers and the Basic Hospital due to service volume. Distribution is shown in Table 1.

Table 1. Health facilities in Health District 18D04, Tungurahua Province.

Health Unit	Type	Nursing Staff		Primary Service Area
		Lic.	Aux.	
Chumaqui Health Center	A	6	1	VCE
Chiquicha Health Center	A	5	1	VCE
El Triunfo Health Center	A	5	1	VCE
Pelileo Basic Hospital	HB	20	5	Emergency Outpatient Clinic Operating Room
Pelileo Basic Hospital Annex	A	5	1	VCE
Huambalo Health Center	B	11	3	Emergency Outpatient Clinic
Patate Health Center	B	8	3	Emergency Outpatient Clinic
Salasaca Health Center	B	10	3	Emergency Outpatient Clinic
Sucre Health Center	A	5	1	VCE
Teligote Health Center	A	5	1	VCE

Notes: Lic. = Licensed nurses; Aux. = Nursing assistants; VCE = Vaccination and Outpatient Clinic; BH = Basic Hospital

Regarding discomfort in different body regions, Figure 1 shows that 80 % of nursing staff reported dorsolumbar discomfort, followed by neck (76 %) and shoulders (52 %). Dorsolumbar symptoms were primarily attributed to repetitive activities, load handling, and accelerated work pace.

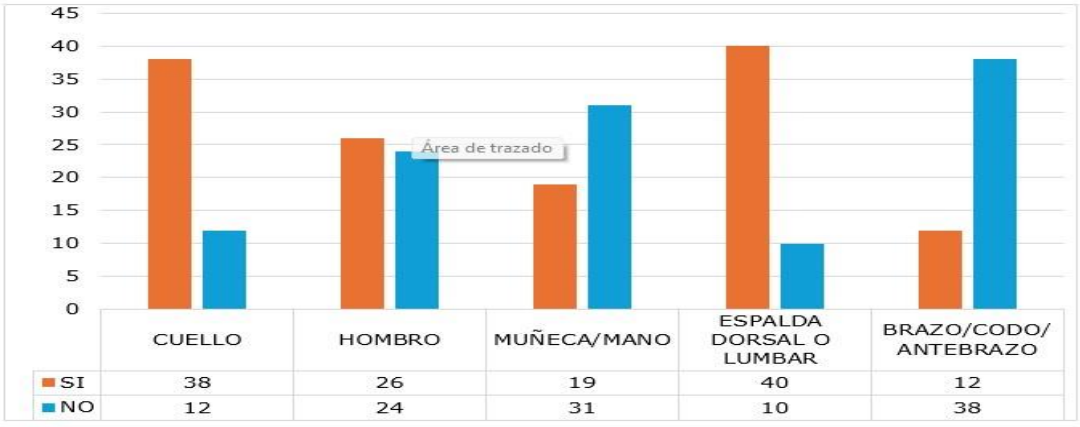

Fig. 1 Location of discomfort in different body regions.

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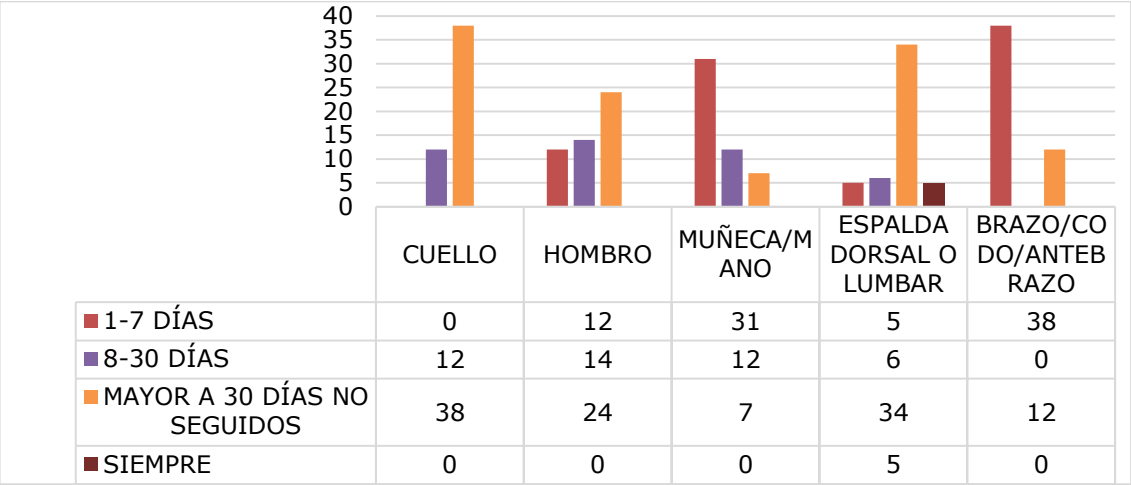
Regarding symptom duration, 46 % reported dorsolumbar discomfort lasting years, 56 % neck discomfort for months, and 68 % arm/elbow/forearm discomfort for days. Most assistants and nurses experienced chronic dorsolumbar symptoms—likely indicating MSDs such as lumbago or disc herniation—due to repetitive forced postures during caregiving tasks.

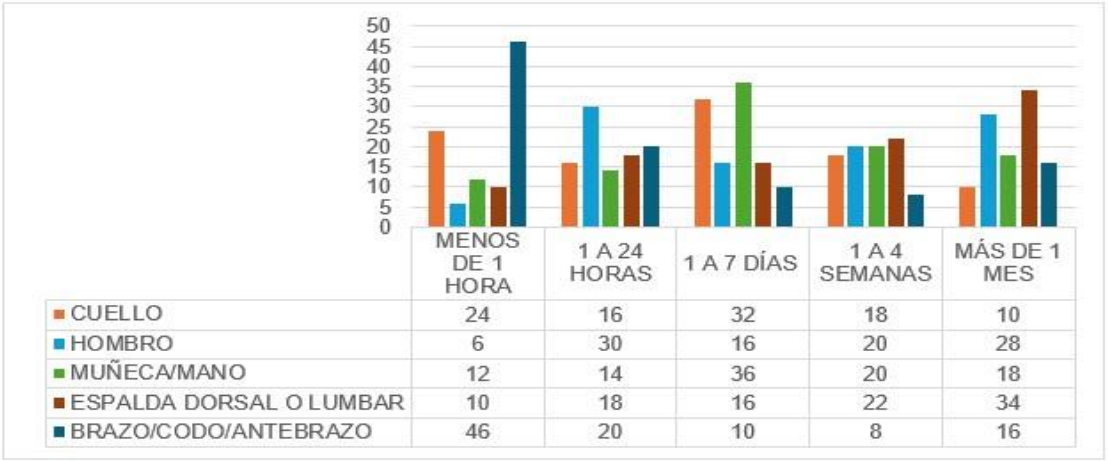
With respect to symptom presence over the past 12 months (Figure 2), discomfort in the neck, shoulders, and dorsolumbar region lasted more than 30 non-consecutive days. In contrast, wrist/hand and arm/elbow/forearm discomfort lasted 1–7 days in 62 % (31) and 76 % (38) of participants, respectively. Prolonged symptoms in key regions reflect the absence of preventive measures such as active breaks, stretching, and muscle strengthening.



	CUELLO	HOMBRO	MUÑECA/MANO	ESPALDA DORSAL O LUMBAR	BRAZO/CODO/ANTEBRAZO
1-7 DÍAS	0	12	31	5	38
8-30 DÍAS	12	14	12	6	0
MAYOR A 30 DÍAS NO SEGUIDOS	38	24	7	34	12
SIEMPRE	0	0	0	5	0

Fig. 2 Duration of discomfort in different body regions over the past 12 months.

Figure 3 shows episode duration: shoulder discomfort lasted 1–24 hours in 30 % of cases, while dorsolumbar discomfort exceeded one month in 34 %. The shortest episodes occurred in the arm/elbow/forearm (<1 hour in 46 %). Most participants reported neck episodes lasting 1–7 days and dorsolumbar episodes >30 days—likely due to high spinal loading combined with poor posture and force exertion, leading to weeks-long symptoms despite symptomatic treatment.



	MENOS DE 1 HORA	1 A 24 HORAS	1 A 7 DÍAS	1 A 4 SEMANAS	MÁS DE 1 MES
CUELLO	24	16	32	18	10
HOMBRO	6	30	16	20	28
MUÑECA/MANO	12	14	36	20	18
ESPALDA DORSAL O LUMBAR	10	18	16	22	34
BRAZO/CODO/ANTEBRAZO	46	20	10	8	16

Fig. 3 Duration of individual discomfort episodes by body region.

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Regarding treatment received in the past 12 months (Figure 4), only 36 % sought care for arm/elbow/forearm discomfort, whereas most received treatment for dorsolumbar symptoms—likely due to severe pain causing functional limitation and work absenteeism.

Fig. 4 Treatment received for discomfort in the past 12 months.

According to the presence of discomfort in the last seven days, it is evident that only 18 % show issues at the level of the arm, elbow, or forearm. The majority have experienced discomfort in the dorsolumbar region during the past seven days. This is due to poor postural hygiene and sedentary behavior, which increases the risk of injury. Based on the intensity of the discomfort, it is observed that, at the neck level, 32 % report a score of 4, indicating that the intensity of the discomfort ranges from moderate to severe, while 10 % report very strong discomfort, with a score of 5. At the shoulder level, 26 % report a score of 1, meaning that discomfort in this body area is mild, while for 20 % it is very strong. In the wrist and/or hand and in the dorsal or lumbar back, 34 % and 36 % respectively report discomfort ranging from mild to moderate, with a score of 2, while 16 % and 8 % of the staff respectively report very strong discomfort. In the arm, elbow, and forearm, 48 % report a score of 3, with moderate discomfort, and 30 % report discomfort ranging from mild to severe. Discomfort in the dorsolumbar region ranges from mild to moderate, which may affect their work performance and quality of life.

Regarding ergonomic risk factors causing forced postures (Table 2), repetitive or vigorous movements were most common (36 %), followed by load handling (30 %) and high work pace (14 %). Static/dynamic work and stress were less prevalent.

Table 2. Ergonomic risk factors causing forced postures.

Ergonomic Risk Factor	No.	%
Repetitive movements	18	36
Load handling	15	30
High work pace	7	14
Stress	2	4
Insufficient rest periods	5	10
Static work	1	2
Dynamic work	2	4

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Pearson's correlation coefficient revealed a strong positive correlation (r = 0,849) between ergonomic risk factors (repetitive movements, load handling, accelerated pace) and affected body regions (neck, shoulders, thoracic/lumbar back). Greater and more frequent exposure to these risks increases the likelihood of musculoskeletal impairment due to forced postures.

DISCUSSION

MSDs caused primarily by forced postures encompass a wide range of signs and symptoms affecting anatomical structures such as bones, muscles, tendons, nerves, and joints. Clinical identification can be challenging, as pain—the main symptom—is subjective and often the sole manifestation.[14]

Forced postures primarily involve the trunk, arms, and legs, occurring both during movement and static positions—such as prolonged arm elevation above the head, standing in one place, sitting without back support, or forward/trunk twisting. These positions reduce blood flow and muscle metabolism, leading to fatigue and musculoskeletal alterations.[15]

The most frequent ergonomic factors causing forced postures are repetitive movements, load handling, and accelerated work pace. Nursing tasks—including vital sign monitoring, wound dressing, patient hygiene, IV insertion, specimen collection, and patient mobilization—contribute to MSD development. Environmental factors (poor lighting, extreme temperatures, noise), individual factors (female sex, older age, overweight/obesity, preexisting conditions, prior injuries), and psychosocial elements must also be considered.

MSDs linked to forced postures include tension neck syndrome, rotator cuff tendinitis, carpal tunnel syndrome, trigger finger, ganglion cysts, dorsalgia, lumbago, disc herniation, and epicondylitis. Once established, these conditions can be managed through physiotherapy, symptomatic medication, injections, supportive devices, alternative therapies (heat/cold), and surgery in severe cases.[16]

The Polytechnic University of Valencia, through the OWAS Method, proposes several positions depending on the affected body area. For the back, four positions are identified: straight back, bent, twisted, and bent with twist. For the arms, three positions are evaluated: both arms below shoulder level, one arm below and the other raised, and both arms raised above shoulder level. For the legs, seven postures are analyzed: sitting, standing with both legs straight, one leg straight and the other bent, standing or squatting with both legs bent with balanced weight, standing or squatting with both legs bent with unbalanced weight, kneeling, and walking.

In addition, the method evaluates the load supported, which is an important factor in developing alterations in the dorsolumbar back. Of all these, position 1 for the back; position 1 for the arms; positions 1, 2, and 3 for the legs; and with a load of less than 10 kg, personnel do not require corrective action, since there are no harmful effects on the musculoskeletal system. On the other hand, position 4 for the back, positions 2 and 3 for the arms, and positions 4, 5, 6, and 7 for the legs, with a load greater than 20 kg, generate extremely harmful effects on the musculoskeletal system. For this reason, corrective actions are required immediately, such as reducing physical work demands, using appropriate personal protective equipment, avoiding continuously holding tools with arms raised or heavy materials, performing varied activities and periodic breaks of at least 10 minutes for every 40 minutes of effective work, and mainly avoiding trunk flexion,

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hyperextension, and torsion, since joints should not be forced. Stretching and muscle-strengthening exercises should also be performed.[15,17]

A study in Quito by Terán et al.,[18] found healthcare workers commonly adopt: slightly twisted/torso-forward sitting (49 %); inclined or sideways posture (16 %); or combined inclination/twist (3 %)—totaling 68 % at risk of MSDs, yet only 3 % implemented urgent preventive measures.

According to Vega et al.,[19] not only forced postures (47,08 %) but also work organization, extended shifts, schedules, insufficient breaks, pace, and workload contribute to MSDs. This combination increases risk of Quervain's tendinitis and carpal tunnel syndrome, as noted by Baquero.[20]

Colombia's Fifth National Pain Survey found ~60 % of the population experiences musculoskeletal pain, with low back pain reported by 27%.[21] In a 2021 cross-sectional study of nursing assistants in a Quito hospital, 100 % reported shoulder and dorsolumbar discomfort within one year, with 5–10 years of work experience.[22]

In a study with healthcare professionals, a high prevalence of musculoskeletal discomfort was observed, mainly in the lumbar and thoracic regions (more than half of the participants), followed by the cervical area and, to a lesser extent, the ankle and foot. These disorders are related to ergonomic factors such as repetitive movements, painful or fatiguing postures, and patient handling, which generate physical overload and reduce flexibility in the hip and trunk. As a consequence, lumbar curvature increases, leading to excessive loads, joint wear, and pressure on the spine, which favors the onset of low back pain and other problems that limit mobility. Depending on their chronicity, these conditions may reduce functional capacity and affect the quality of life of healthcare personnel, highlighting the need for preventive strategies and intervention programs to reduce the prevalence of musculoskeletal disorders.[11,23,24]

In hospital settings, female staff show greater MSD vulnerability, impacting job performance. This is linked to continuous physical effort and patient-care tasks requiring forced postures and bodily strain. Additional risk factors include older age and obesity—both increasing MSD likelihood and hindering recovery. In contrast, normal-weight individuals show better symptom resolution. These findings highlight the need to consider gender, age, and nutritional status in occupational health programs to reduce MSD prevalence and improve staff well-being.[19,20,25]

MSDs negatively affect sleep quality, daily functioning, and overall quality of life. Thus, preventive and therapeutic programs—and mediation strategies for modifiable risk factors—are essential. Preventive strategies include ergonomics education, workplace safety policies, and ergonomic redesign. Therapeutic approaches involve pharmacological treatment, physiotherapy, occupational therapy, and surgery in severe cases. This study not only assesses forced posture impacts on nursing staff but also on all healthcare workers—including physicians, surgeons, administrative, and service personnel—who face similar risks. Findings can enhance job satisfaction, patient care quality, and nursing productivity.[26]

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CONCLUSIONS

Nursing staff routinely adopt forced postures—such as prolonged standing, unsupported sitting, forward trunk inclination, and arm elevation—combined with ergonomic risk factors including repetitive movements, patient handling, high work pace, stress, and insufficient rest. These contribute to MSDs such as dorsalgia, lumbago, and disc herniation (back); rotator cuff tendinitis (shoulder); carpal tunnel syndrome, trigger finger, and ganglion cysts (wrist/hand); and epicondylitis (arm/elbow/forearm). The dorsolumbar region is most affected and a leading cause of disability, followed by neck and shoulders. These conditions—capable of reducing performance and quality of life—highlight the urgent need to implement MSD prevention, training, and treatment programs as a priority in healthcare settings to reduce prevalence and occupational consequences among healthcare workers.

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