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Ergonomic factors and their relationship with musculoskeletal disorders in nursing personnel in Latin America

Factores ergonómicos y su relación con trastornos musculoesqueléticos en el personal de enfermería en América Latina

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Abstract

This study analyzes the ergonomic factors that contribute to the development of musculoskeletal disorders (MSDs) in nursing personnel in Latin America, through a systematic literature review covering research published between 2020 and 2024 in databases such as PubMed, Scopus and SciELO. Manual mobilization of patients, prolonged awkward postures and repetitive movements were identified as the main risks, linked to a high prevalence of MSDs in regions such as the lumbar, cervical and upper extremities. The results show that these conditions are a direct consequence of the high physical load associated with nursing work.

Keywords: nursing, ergonomics, prevention, occupational health, musculoskeletal disorders.

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Resumen

Este estudio analiza los factores ergonómicos que contribuyen al desarrollo de trastornos musculoesqueléticos (TME) en el personal de enfermería en América Latina, a través de una revisión bibliográfica sistemática que abarca investigaciones publicadas entre 2020 y 2024 en bases de datos como PubMed, Scopus y SciELO. Se identificaron como principales riesgos la movilización manual de pacientes, las posturas incómodas prolongadas y los movimientos repetitivos, vinculados a una alta prevalencia de TME en regiones como la zona lumbar, cervical y las extremidades superiores. Los resultados evidencian que estas afecciones son consecuencia directa de la alta carga física asociada al trabajo de enfermería.

Palabras clave: enfermería, ergonomía, prevención, salud ocupacional, trastornos musculoesqueléticos.

Introduction

Musculoskeletal disorders (MSDs) represent one of the main causes of incapacity and absenteeism in many professions, with nursing personnel being one of the most affected groups. This problem not only compromises the health of workers, but also has a negative impact on the quality of health services. The physically demanding nature of nursing exposes professionals to various ergonomic risk factors, such as mobilizing and transferring patients, lifting heavy loads, and adopting awkward postures for prolonged periods of time (Ballena-Ramos et al., 2021). These conditions, recurrent in the hospital environment, predispose to the development of MSDs, especially affecting areas such as the lower back, neck and shoulders. Several studies have linked these working conditions with a high prevalence of musculoskeletal complaints in these areas of the body (Fajardo-Bautista et al., 2024).

MSDs comprise a variety of conditions that can develop gradually or arise as a result of acute incidents. These conditions affect muscles, tendons, ligaments, joints and nerves, which can generate chronic disabilities. According to the World Health Organization (2021), about 1.71 billion people worldwide suffer from MSDs, with low back pain being the most common. This ailment limits mobility, affects functional abilities and ultimately compromises both work productivity and the quality of life of those who suffer from it.

In addition, the European Agency for Safety and Health at Work (2022) warns that MSDs are one of the most common conditions among workers worldwide, triggered by factors such as load handling, repetitive movements, improper posture, cold working environments, long working hours and unhealthy behavioral habits.
In the specific case of nursing, ergonomic risks are closely linked to the high prevalence of MSDs. A recent study in a sample of 60 nurses revealed that the most common

discomforts are found in the neck (28.33%), shoulders (25%), upper back (25%), wrist (13.33%) and lower back (1.67%). These data reflect the impact of the physical tasks involved in nursing, particularly the manual mobilization of patients, which forces professionals to adopt unergonomic postures and to make intense physical efforts. According to the OWAS method, these postures are a major cause of musculoskeletal injuries in this professional group (Pinta et al., 2024a).

The impact of MSDs on nursing staff is not only limited to physical health. These conditions also negatively influence the quality of patient care and the overall efficiency of the healthcare system. In many instances, nurses must continue to work despite pain, which increases the risk of developing more serious injuries and even permanent disabilities. This not only generates an increase in costs for healthcare institutions, due to the use of medications and workers' compensation, but also affects staff morale and job satisfaction, contributing to absenteeism and job turnover (Elizalde Ordoñez et al., 2024).

The prevalence of MSDs in nursing staff is alarming. A study conducted in a hospital in Cuenca, Ecuador, found that 77% of nurses experienced low back pain, 69% experienced ankle and foot pain, and 46% experienced neck discomfort. These findings underscore the urgency of implementing preventive measures to address this issue (Gualán and Reinoso, 2023). Similarly, a study in Argentina highlighted that unfavorable working conditions, such as lack of ergonomic equipment and incorrect postures, are significant risk factors for the development of musculoskeletal injuries. This study also linked these conditions to high rates of absenteeism due to medical leave for occupational health problems (Acosta et al., 2022).

The main objective of this study is to analyze the ergonomic factors that contribute to the development of MSDs in nursing personnel. In addition, it seeks to identify working conditions and evaluate ergonomic practices that could reduce these risks. A key hypothesis posits that the implementation of improved ergonomic practices, along with awareness campaigns and training, would significantly contribute to decreasing the prevalence of MSDs, improving the quality of life of nursing staff and the medical care they provide.The literature reviewed points to a direct relationship between the lack of ergonomics in the workplace and the incidence of MSDs in nursing. Among the most recurrent factors are manual handling of patients, lifting heavy loads, and adopting awkward postures for prolonged periods of time. In addition, recent studies have identified that psychosocial factors such as work stress and lack of social support also play an important role in the occurrence of these conditions (Soledad et al., 2022; Zare et al., 2021).

This study is based on a systematic literature review, using recognized databases such as PubMed, Scopus and SciELO, and considering research published between 2020 and 2024. This methodology guarantees the timeliness and relevance of the data analyzed, allowing a deeper understanding of the ergonomic factors that influence MSDs and proposing practical solutions to mitigate these risks in the work environment of nursing staff.

Materials and methods

The methodological approach of this study is qualitative, with a descriptive-exploratory design based on a systematic literature review. This type of research is used to analyze, synthesize and relate existing information on ergonomic factors and their impact on musculoskeletal disorders (MSDs) in nursing personnel in Latin America. The review allows the identification of trends, gaps in the literature and intervention strategies documented in various scientific sources.

The search process focused on identifying relevant studies using a systematic strategy based on keywords such as "ergonomics," "musculoskeletal disorders," "nursing, ' and 'work-related risk factors,"combined with Boolean operators (AND and OR). These searches were conducted in English and Spanish, covering both global and regional research.

Recognized academic databases such as PubMed, Scopus, Web of Science (WoS), Redalyc and SciELO, selected for their high quality and peer review, were consulted. In addition, complementary sources such as theses, institutional reports and book chapters were included, allowing for a multidisciplinary approach. This design ensures an exhaustive and updated coverage of the subject matter, with a focus on research published between 2020 and 2024 to guarantee the temporal relevance of the findings.

Inclusion and Exclusion Criteria

Selected studies had to meet the following inclusion criteria:

- Publications conducted between 2020 and 2024, with the aim of ensuring the timeliness of the data.
- Articles published in English or Spanish, to reflect a global and regional scope in the literature.
- Research specifically examining ergonomic factors and their impact on MSDs in nursing staff.
- Empirical studies or systematic reviews with clearly defined methodologies, including relevant samples of health personnel.

On the other hand, we excluded those studies that:

- Did not specify a direct relationship between ergonomic factors and MSDs.
- Lacked sufficient data or transparent methodologies to assess their quality.
- Focused exclusively on non-hospital contexts or on professions other than nursing.
- Duplicate publications or articles with a purely theoretical approach without empirical data.

Quality Assessment of Studies

To ensure the validity and reliability of the selected studies, critical appraisal tools were applied, such as the CASP (Critical Appraisal Skills Programme) checklists. These criteria made it possible to assess key aspects such as:

- Clarity in the study objectives.
- Rigor in the methodological design (type of study, sample size, tools used).
- Transparency in data collection and analysis.
- Relevance of the results and their practical applicability.

The studies were categorized according to their level of evidence and methodological quality. Those with significant weaknesses in their design or analysis were excluded from the final analysis.

Synthesis and Analysis of Results

The extracted information was organized in an analysis matrix that allowed us to identify patterns, similarities and discrepancies among the selected studies. Priority was given to investigations with clear statistical data and to those that included ergonomic intervention proposals. In addition, existing gaps in the literature were evaluated, proposing areas for future research to address unresolved problems, such as the implementation of ergonomic strategies in low-resource or rural hospitals. This methodological approach ensures that the results of the review are not only relevant and up-to-date, but also provide a solid basis for discussion and practical recommendations in the context of nursing staffing in Latin America.

Results

Identifying Ergonomic Risk Factors in Nursing Personnel

Musculoskeletal disorders (MSDs) represent one of the main occupational health concerns among nursing professionals. Ergonomic risks derived from the physical nature of nursing work are one of the main causes of these disorders, affecting the quality of life of workers and, in many cases, the efficiency in the provision of health services (Ruiz, 2023).

Ergonomic risks in nursing professionals, according to several studies, indicate that musculoskeletal disorders, especially in the neck, lower back, wrists, hands and shoulders, are the most prevalent, attributable to poor posture and an increasing workload due to the increase in hospital care (Changalombo et al., 2024). These risks include mechanical, physical, biological, chemical and psychosocial factors, derived from prolonged postures, repetitive movements and extensive walking. Weight lifting and patient mobilization are the main causes of these disorders, in addition to dysergonomic risks associated with inadequate design of the work environment (Elizalde Ordoñez et al., 2024).

Several studies have identified ergonomic risk factors, including patient mobilization, awkward and prolonged postures, and the handling of heavy loads. This analysis aims

to compare the findings in different studies regarding ergonomic factors that contribute to the development of MSDs in nursing staff.

One of the most recurrent factors identified in the literature is the mobilization and manual handling of patients, which has been pointed out as the main risk factor in multiple studies. According to Fajardo-Bautista et al. (2024), manual mobilization is responsible for a large part of musculoskeletal injuries in nursing, due to the lack of adequate assistive devices and the performance of this task without adequate training in ergonomics. This finding is consistent with Azuero-Criollo et al., (2023), who also identified patient mobilization as the main risk factor, mentioning that 80% of the respondents in their study reported low back pain, attributed to the frequent forced postures adopted during patient handling.

On the other hand, Pachucho Flores et al. (2023), highlights that not having ergonomic devices, as well as the need for mechanical systems for weight lifting, are the main reasons for the occurrence of MSDs. This study also found a fairly frequent level of injuries in the waist or early region, and for the manual mobilization of patients, it is one of the most unfavorable tasks for the nurse. In addition, Llanas, et al (2022) points out that the mobilization of patients, as well as the manipulation of load elements, notably increase the probability of presenting musculoskeletal alterations in the upper extremities and spine.

This coincidence between studies points to the manual mobilization of patients as the ergonomic factor of greatest risk for nursing professionals, suggesting that one of the main interventions should be the provision of adequate equipment to assist in this task.

Another important ergonomic risk factor is the adoption of awkward and awkward postures for long periods of time. Chichande and Molina, (2021) mentions that nursing professionals often adopt awkward postures due to the need to bend or stay in one position for long periods, especially when caring for immobilized patients or those requiring special care. This study found that repeated trunk flexion and prolonged static postures are one of the most common causes of pain in the spine and upper extremities.

This finding is similar to that presented in Elizalde Ordoñez et al. (2024), where forced and maintained postures during prolonged medical procedures were identified as a critical factor in the development of MSDs. It is mentioned that 76% of the nursing professionals who participated in the study reported pain in the dorsal spine due to the postures they adopt to assist patients.

Likewise, Osorio-Vasco and Rodriguez, (2021) emphasize that awkward postures during long work shifts exacerbate musculoskeletal problems in nursing professionals, particularly in the lumbar area and shoulders. The adoption of these postures is inevitable due to the nature of nursing work, where tasks require repetitive movements and constant bending to manipulate patients.

Nursing work also involves a significant amount of repetitive movements, especially during equipment handling, patient mobilization, and general medical care. Cardenas,

(2024) highlights that repetitive movements, especially those performed in awkward postures, such as twisting or bending, are responsible for much of the musculoskeletal pain experienced by nurses. The study highlights that repetitive movements in combination with lack of adequate rest contribute to the development of upper extremity disorders.

This conclusion is supported by Rodriguez, (2024) , who found that repetitive movements are one of the main ergonomic risk factors in nursing staff, especially during procedures that require repetitive manual dexterity, such as applying medications, administering intravenous infusions and handling surgical equipment. This study identified a 65% prevalence of wrist and hand pain among respondents, suggesting that repetitive movements significantly affect the upper extremities. The physical burden on nursing staff is not limited to just moving patients from one location to another, but also to standing or wandering for prolonged periods of time. Lata Carranza et al. (2024) states that standing for long hours is another important risk factor in the development of musculoskeletal disorders, particularly in the lower extremities. Participants of the study, nursing professionals, said that their working hours, more than 8 hours a day, required for a great extension of the body in vertical position, which generates pain and exhaustion of the legs, feet and back. Similarly, Pesántez et al. (2021) state that long working hours, often involving night shifts, increase the effects of ergonomic factors on nursing staff. The physical fatigue resulting from these prolonged shifts increases the chances of injury to the back region and upper extremities, especially in cases where there are insufficient breaks or properly scheduled rest periods.

Several studies highlight that the work environment, together with inadequate equipment, also contribute to ergonomic risks in nursing personnel. Gualán and Reinoso, (2023) stress the influence of factors such as temperature, lighting and noise on the occurrence of musculoskeletal problems, mentioning that adverse working conditions not only affect the physical well-being of nurses, but also their ability to perform tasks efficiently. This study found that 60% of nursing professionals in settings with unfavorable environmental conditions reported an increase in musculoskeletal symptoms.

Acosta et al., (2022) also mentions the lack of adequate equipment, especially in terms of mechanical aids for patient mobilization, as a factor that increases ergonomic risks. The lack of such equipment forces nursing professionals to rely on their own physical strength to perform tasks that require lifting or moving patients, which increases the load on their musculoskeletal system.

One of the underlying causes of the high prevalence of MSDs in nursing staff is the length of working hours and lack of adequate breaks. Pesántez et al, (2021) mentions that nursing professionals often work extended shifts of more than 8 hours, which increases the risk of musculoskeletal injuries due to accumulated fatigue. The lack of regular breaks exacerbates this problem, as workers do not have sufficient time to recover between physically demanding tasks (Vaca et al., 2023).

Similarly, Rodriguez (2024) found that the absence of adequate breaks during long workdays is a factor that aggravates musculoskeletal problems, especially in the lower extremities, as professionals spend most of their time on their feet or on the move. The accumulation of fatigue throughout the shift increases the vulnerability of nurses to developing MSDs.

Physical activity, such as working in inadequate postures or performing a continuous task for extended time, already involves risk of acquiring Musculoskeletal Disorders (MSD). Gualán and Reinoso, (2023) pointed out that musculoskeletal disorders are often associated with non-compliance with basic working conditions.

They frequently lack the necessary ergonomic construction features, contributing to the increased prevalence of musculoskeletal disorders (MSDs). This study concludes that the lack of resources and equipment, such as adjustable chairs and patient mobilization aids, increases the risk of developing MSDs, especially in areas such as the lower back and shoulders.

Musculoskeletal disorders (MSDs) among nursing staff have been well documented, as it is one of the most recognized causes of absenteeism and even diminished quality of life in this group of individuals. MSDs develop predominantly as a result of manual lifting of patients, awkward body positions or repetitive body movements. In response to the growing concern for the occupational safety and health of the nursing professional, the literature has suggested various ergonomic intervention strategies along the lines of prevention in order to reduce the hazards associated with such injuries. This analysis aims to compare the findings on the most effective preventive strategies identified in the reviewed studies, highlighting those that have proven useful in reducing ergonomic hazards and improving the working conditions of nursing professionals.

Prevalence of musculoskeletal disorders in nursing professionals.

MSDs include a variety of conditions that affect muscles, tendons, ligaments, joints and nerves, causing pain, discomfort and, in severe cases, permanent disability. In nursing professionals, the prevalence of these disorders has been well documented in multiple studies, which point to occupational factors such as long working hours, manual mobilization of patients, and awkward and repetitive postures as the main causes (Armas and Chiriboga, 2020). This analysis seeks to compare data on the prevalence of MSDs in different studies, focusing on the areas of the body most affected and the factors that contribute to their occurrence.

Several studies have documented the high prevalence of MSDs in nursing professionals. For example, Osorio-Vasco and Rodriguez, (2021) reports that 66% of the body areas evaluated in a sample of nursing professionals experience pain during working hours. The data from this study highlight that musculoskeletal problems most frequently affect the lower back and shoulders, these being the most vulnerable areas. In the research by Gualán and Reinoso (2023) , an even higher prevalence is observed, with 77% of the respondents reporting pain in the lower back and 69% in the ankles

and feet. This study, conducted in a hospital in Cuenca, Ecuador, highlights that nursing professionals experience significantly higher levels of muscle pain than the average working population. The high frequency of these disorders suggests that working conditions in nursing are a key factor contributing to the onset of MSDs. On the other hand, Pachucho Flores et al. (2023) provides a more specific analysis of the surgical area, finding that 75% of healthcare workers in that area experience pain in the neck, 80% in the lower back, and 80% in the wrists and hands. This study shows that nursing professionals working in physically demanding areas, such as surgery, are particularly exposed to developing MSDs due to a combination of ergonomic factors and the demands of their work environment.

A recurrent aspect in the literature reviewed is the identification of the areas of the body most affected by MSDs in nursing staff. Chichande and Molina, (2021) mentions that 57% of nursing professionals report pain in the neck, 46% in the lower back, and 37% in the head. This suggests that the cervical area and the lumbar region are the most vulnerable to the occurrence of MSDs, which is consistent with other studies. Similarly, Pesántez et al., (2021) reports that 94.3% of nurses surveyed reported neck pain, making it the most affected area, followed by the low back (87.4%) and feet (59.7%). This finding highlights the high incidence of neck pain, which may be related to forced postures and patient handling, which require constant bending and flexing of the neck.

In addition, Gualán and Reinoso, (2023) highlights that 80% of the nursing staff surveyed report myalgia (muscle pain) in the upper extremities, and 60% suffer from bursitis or disc herniation, which indicates a significant affectation in the extremities and spine due to the physical workload. This study also notes that the upper extremities, including the wrists and shoulders, are frequently affected by repetitive motions and the handling of heavy medical equipment.

The low back is consistently the most affected region in the studies reviewed. Azuero-Criollo et al. (2023) shows that 72% of nursing professionals report low back pain, confirming that awkward postures, manual mobilization of patients and lack of mechanical aids contribute to the high level of MSD prevalence in this region of the body. This result is aligned with Fajardo-Bautista et al., (2024), who also identified the lower back as the most frequently affected region, noting that the physical burden of daily nursing activities increases the risk of lower back injuries.
In the article by Naranjo et al. (2023), it is reported that musculoskeletal disorders (MSDs) in nursing professionals are a highly prevalent occupational health problem, affecting between 80% and 85% of workers in this area. The most affected regions include the lower back, where approximately 66.4% of nurses report pain, followed by the neck (56.3%) and knees (51.2%). These injuries are strongly associated with the manual mobilization of patients and the adoption of inadequate postures during long working days. The high incidence of MSDs generates significant absenteeism, affecting both the health of professionals and the efficiency of the healthcare system, which underscores the urgent need to improve ergonomic conditions in hospital environments.

The neck and cervical region are other common areas of affectation in nursing staff. In the research of Llanas, et al., (2022), it is reported that 60% of nursing professionals experience neck pain, especially after long working days where static or inclined postures are required. This finding is reinforced in Elizalde Ordoñez et al., (2024), where it is mentioned that neck pain is particularly frequent in nurses who spend long periods performing administrative tasks or assisting patients in positions that require constant neck flexion.

Likewise, Acosta (2022) highlights that the adoption of awkward postures and the handling of patients without proper equipment contribute to the high prevalence of neck pain, reporting that 37% of nursing professionals experience pain in this area on a constant basis.

The upper extremities, particularly the shoulders, wrists and hands, are also frequently affected by MSDs. In Gualán and Reinoso, (2023) , 65% of respondents reported pain in the wrists and hands, which can be attributed to the repetitive movements involved in nursing tasks, such as medication administration and general medical assistance. The study mentions that the continuous use of heavy medical instruments, such as medication trays, is one of the main causes of this pain. Similarly, Lata Carranza et al.,(2024) found that the upper extremities are one of the most affected areas, with 80% of respondents reporting pain in the wrists and 60% experiencing shoulder problems due to heavy lifting. This finding suggests that repetitive physical activities, such as handling equipment and assisting in patient transfer, are key factors in the development of upper extremity MSDs.

Ergonomic Intervention Strategies

Within the critical analysis of studies dealing with the prevention of ergonomic disorders in the nursing field, it is clear that, although ergonomics training is an effective strategy, several studies appeared with varying biases in practical application and implementation. For example, Elizalde Ordoñez et al. (2024) noted how a well-structured training program could reduce injuries by showing staff how to safely mobilize patients in routines. However, periodic renewal of such programs is vitally important, a recommendation that not all healthcare institutions are able or willing to implement consistently. Rodriguez (2024), however, notes that such training should be done as part of the organizational structure, and while he advocates such changes, he does not explain how physical practice or allocation of time resources would impact the actual implementation of such changes.

Similarly, with regard to the use of assistive equipment and devices, there are equally logistical and economic despite agreement on their benefits. Azuero-Criollo et al. (2023) and Pachucho Flores et al. (2023) note that lifting devices and adjustable beds significantly reduce physical strains on staff, however, Pesántez et al. (2021) warns of over-reliance on these devices due to unavailability and neglect, a scenario often found in underdeveloped hospitals. These above scenarios only compound the burden, as it only affects the ease of work for hospitals with 100 percent investment in devices

without help to benefit the rest, increasing the imbalance in reported benefits. It is widely known and practiced that the introduction of regular breaks and task rotation helps alleviate residual stress for workers, however, this is more of an administrative than a practical strategy and, as a result, some hospitals are unwilling or lack the means to implement. Osorio-Vasco and Rodriguez (2021) and Hernandez Nava et al. (2022) are of the opinion that breaks and several rotations can help alleviate muscle fatigue, while Llanas et al. (2022) show that, depending on the situation, workload and understaffed conditions restrict the effective implementation of this strategy and raise doubts about the universal applicability of certain measures.

Another important aspect to be taken into consideration is the ergonomic design of the work environment; however, in Latin America there is a negative correlation between theory and practice. Carrasco et al. (2023) and Gualán and Reinoso (2023) postulate adjustments in the conditions and furniture elements of workstations with the intention of avoiding MSDs, but Aceves-González et al. (2021) highlight that this is an important limitation in the region. This limitation implies that, even if the ergonomics of the design is correct, in practice the situation is very different, since the availability of resources and the degree of institutional commitment would have to be high.

Finally, the very involvement of personnel is essential for minimal risk in active MSDs; scientific assessments are regularly carried out as part of the ergonomic program to quantify risks. Lata Carranza et al. (2024) show results of their research where they compared the actions carried out by experts and which have allowed that in hospitals in Ecuador the identification of risks has increased. Rodriguez and Acosta (2023) emphasize the evaluation focusing on the process and add that the risk assessment process requires the inclusion of nursing staff in the assessments to obtain more realistic and applicable information. However, the use or application of these assessments in a systematic way remains a challenge in resource-limited institutions.

Situation in Latin America on ergonomics and musculoskeletal disorders in nursing professionals

Nursing professionals in the Latin American region find themselves in a work environment that presents other dimensions of commitment, in this case of ergo-psychosocial character, which corresponds to the high rate of MSDs, being one of the pathologies with the highest degree of prevalence worldwide and which limits or even invalidates the work performed, generating an impact both on the quality of life of the workers and on the functionality of the health systems. Ergonomics, which involves designing the work in such a way that it adjusts to the physical and mental capacities of the worker, is capable of raising the level of health in the sector and preventing these injuries, although its application faces great challenges in the region.

Manual mobilization of patients without an appropriate mechanical device is one of the ergonomic risk factors that stand out in Latin America. In a hospital in Cuenca, Ecuador, the majority of nurses, specifically 77% of all nurses, presented low back pain when performing this activity, Gualan and Reinoso (2023). To this same opinion, Azuero-

Criollo et al. (2023) add that the absence of cranes and ergonomic lifting systems exacerbates this problem, forcing workers to perform physically hard work manually, which, in turn, causes an increase in the number of musculoskeletal injuries. Practically in this situation the mobilization of patients is more difficult in a rural hospital where resources are scarce and only physical strength is used to move the patient.

Another of the diagnoses in patient care are postures that are uncomfortable and awkward to perform, and which are frequent during care and during surgical procedures. For example, Chichande and Molina, 2021, have reported that the assumption of active postures is related to the development of muscle and skeletal pain. Osorio-Vasco and Rodriguez 2021 especially highlight abnormal postures adopted in the course of assisting patients and performing patient care or treatment procedures, which cause low back and neck pain. The shortage of ergonomic workstations and adjustable chairs multiplies these risks, i.e., both the physical health of nurses and their ability to perform nursing activities without interruptions and other detrimental factors.

Repetitive movements, another relevant ergonomic factor, also cause the occurrence of MSDs in nursing staff. As Tenorio reported in July 2024, sixty-five percent of nurse practitioners felt wrist and hand pain because they perform activities with equipment to pierce medical instruments and even medication tubs. Although these activities may seem benign in the short term, they begin to cause microtraumas that will develop into chronic injuries over time. These injuries affect the functionality of the upper extremities and compromise your nurse's range of action and, therefore, action in optimal performance of their duties.

In addition, prolonged hours of work without sufficient recovery time result in the accumulation of fatigue, reducing the body's recovery intervention and, thus, increasing the risk of injury. Hernandez Nava et al. (2022) note that prolonged and continuous shifts of more than eight hours duration increase physical fatigue while Pesántez et al. (2021) emphasize that in some hospitals understaffing forces nurses to work excessive hours without reasonable breaks. Work overload is also prevalent in rural and public hospitals where there is a shortage of resources and manpower, thus aggravating MSDs among this population.

However, other countries in the region such as Argentina and Chile have implemented training programs in their hospitals for nursing staff where they are taught safe practices for patient movement and proper postures (Chichande and Molina, 2021) despite the high prevalence of MSDs. In some regions of Latin America, ergonomic intervention measures have been implemented to prevent MSDs among staff. Ergonomics training is one of the most widely used strategies to prevent MSDs. However, Rodriguez and Acosta (2023) suggest that ergonomic evaluations be carried out with nurses involved, being a staff that can detect problems and is expected to comply with the advice given.

The implementation of ergonomic devices such as cranes and adjustable beds has been shown to be effective in reducing MSD, as it reduces the physical stress of nursing staff. As Azuero-Criollo et al. (2023) point out, the sustained application of such devices

decreases the risk of back and shoulder injuries. In the opinion of Pachucho Flores et al. (2023), other devices such as adjustable beds and ergonomically designed carts ensure easier and more efficient performance of daily routines, as staff can position patients without undue tilting or awkward postures. However, Pesántez et al. (2021) argue that the lack of maintenance and training in the use of these devices affects their effectiveness. In many Latin American hospitals, ergonomic devices are used inappropriately due to damage or lack of knowledge on how to use them.

Another significant intervention is the rotation of tasks and the application of short breaks during working time, which have shown positive consequences in the reduction of fatigue and MSD. Osorio-Vasco and Rodriguez (2021) recommend work breaks and shift rotation as appropriate ways to combat muscle fatigue. For their part, Llanas et al. (2022) indicate that this strategy has led to a 40% reduction in muscular pain in nursing personnel in some hospitals that have applied these systems.

Although there have been these achievements, there are difficulties that negatively affect the effectiveness of ergonomic interventions in the Latin American context. One of the main limiting factors is the lack of economic resources for the purchase of ergonomic equipment and the development of training activities. Many hospitals do not have the necessary aids paid in advance by many hospitals, even more so if one considers that nursing personnel are still exposed to avoidable risks. On the other hand, Acosta (2022) points out that the absence of awareness of occupational ergonomics is another unfavorable factor, which in rural areas is even more pronounced.

Finally, although there are different ergonomic proposals and strategies that have proven to be effective in the prevention of MSDs in nurses, important challenges must be faced when implementing them in Latin America. Lack of resources, awareness and qualified personnel restrict the implementation of these interventions and leave nursing workers in work situations that are detrimental to their health and the quality of care they can provide to patients. For truly effective change to occur, it is critical that health systems in the region understand the need to apply ergonomics to the workplace and make appropriate investments to establish safe and healthy workplaces. Such training, along with ongoing training of health care workers and their managers, is equally fundamental to establishing improvements in the culture of occupational safety accessible to workers and the patients who need them.

Conclusions

Musculoskeletal disorders (MSDs) are one of the most prevalent conditions among nursing professionals in Latin America, with the most affected areas being the lumbar region, cervical and upper extremities. The main causes of these disorders are found in the physical demands inherent to nursing work, such as manual mobilization of patients, prolonged and repetitive postures, and the handling of medical equipment in suboptimal conditions. These factors not only affect the physical health and well-being

of professionals, but also the quality of patient care and the efficiency of the healthcare system.

The study highlights that, although there are effective ergonomic strategies to mitigate these risks, such as training in proper mobilization techniques, the provision of ergonomic equipment and the organization of regular breaks during working hours, their implementation is limited in many hospitals in the region. This problem is particularly acute in rural areas, where the lack of economic and technological resources aggravates the working conditions of nursing personnel.

Comparison of the findings reveals that Latin American countries face structural and financial challenges that hinder the widespread application of ergonomic measures. In contrast, countries with more advanced ergonomics and occupational health policies show a lower incidence of MSDs in their nursing staff, underscoring the need to strengthen public policies and prevention programs in the region.

It is concluded that addressing MSDs in nursing professionals requires a comprehensive approach that combines continuous ergonomic training, investment in assistive equipment, and the design of healthy work environments. These actions would not only reduce the incidence of MSDs, but also improve the quality of life of workers and the operational efficiency of health systems, promoting safer and more effective patient care.

For future studies, it is recommended to expand research in specific areas, such as the long-term effectiveness of ergonomic interventions in different hospital settings, and to explore how psychosocial factors interact with physical risks in the development of MSDs. It would also be beneficial to analyze the economic impact of MSDs on health systems in the region to justify investment in sustainable ergonomic programs.

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