

REVIEW

STRATEGIES TO MINIMIZE ERGONOMIC RISKS IN THE CLEANING STAFF: AN INTEGRATIVE REVIEW

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ABSTRACT

Objective: to identify strategies to minimize ergonomic risks in the cleaning staff.

Method: an integrative review, carried out on LILACS, Scopus, and MEDLINE/PUBMED databases, between August and September of 2019. The descriptors "ergonomics", "cleaning service", and their synonyms were combined using Boolean operators.

Results: from the 21 articles analyzed, intervention studies prevailed and were classified with a level of evidence 2 (52%); carried out in the year 2012 (33.3%), in Sweden (38%), with hospital cleaning staff (47.6%). The use of ergonomic education strategies, changes in work tools, aerobic exercise, a method for risk assessment, surveillance protocol, task diary, updating with organizational and psychosocial factors at work were evidenced.

Conclusion: the evidenced strategies proved to be effective and may contribute, for the health area, in the promotion and recovery of the physical condition of the cleaning staff.

DESCRIPTORS: Worker's health; Ergonomics; Housekeeping; Health promotion; Review.

ESTRATEGIAS PARA MINIMIZAR LOS RIESGOS ERGONÓMICOS EN TRABAJADORES DE LIMPIEZA: REVISIÓN INTEGRADORA

RESUMEN:

Objetivo: identificar estrategias para la minimización de los riesgos ergonómicos en trabajadores de limpieza. **Método:** revisión integradora, realizada en las bases de datos LILACS, Scopus y MEDLINE/PUBMED, entre agosto y septiembre de 2019. Los descriptores "ergonomía", "servicio de limpieza" y sus sinónimos fueron combinados por operadores booleanos. **Resultados:** entre los 21 artículos analizados, prevalecieron los estudios de intervención clasificados con nivel de evidencia 2 (52%); realizados en 2012 (33,3%), en Suecia (38%), con trabajadores de limpieza hospitalaria (47,6%). Se evidenció la utilización de estrategias de educación ergonómica, modificaciones en las herramientas de trabajo, ejercicio aeróbico, método para la evaluación del riesgo, protocolo de vigilancia, diario de tareas, contextualización con los factores organizacionales y psicosociales del trabajo. **Conclusión:** las estrategias evidenciadas se mostraron eficaces y podrán contribuir, en el campo de la salud, en la promoción de la salud y recuperación de las afecciones físicas que padecen los trabajadores de limpieza.

DESCRIPTORES: Salud del Trabajador; Ergonomía; Servicio de Limpieza; Promoción de la Salud; Revisión.

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INTRODUCTION

The cleaning staff is a category that is sometimes disregarded in the workplace⁽¹⁾. In the current setting, they are considered to be co-responsible for keeping a safe environment⁽²⁾, through the elimination of dirt, unwanted waste, and microorganisms in the environment, contributing to the reduction of infection rates⁽²⁾ and accidents at work⁽¹⁾.

The cleaning duty has been associated with multiple ergonomic risks, which brings postural changes and occupational injuries, such as musculoskeletal disorders⁽³⁻¹⁸⁾. Ergonomic risk is understood as any factor that may interfere with the worker's psychophysiological characteristics, causing discomfort or affecting his/her health, such as physical effort, weight lifting, excessive work pace, repetitive movements, and awkward work posture⁽¹⁹⁾.

The exposure of cleaning staff to ergonomic risks is associated with the work process, characterized by the vigor and speed in activities, use of physical strength and physical weight lifting^(11,17). However, frequent tasks, despite having standard tools and techniques, are not adapted to the psychophysiological needs of workers, exposing them to work accidents, decreased functional capacity and the development of occupational diseases⁽²⁰⁾.

The benefits of using ergonomics include improving the worker's quality of life and health⁽²⁾, increasing productivity, and the quality of the service provided⁽²⁰⁾. Given the above, the objective is to identify in the literature strategies for minimizing ergonomic risks in cleaning staff.

METHOD

An integrative literature review carried out in six stages: identification of the theme and formulation of the research question; outlining of inclusion and exclusion criteria; choice of the information to be extracted; evaluation; interpretation and synthesis of evidenced knowledge⁽²¹⁾.

The PICO structure⁽²²⁾ was used to formulate the research question. Cleaning staff was adopted as "P" (population); "I" (intervention or indicator) the strategies and "O" (outcome) the minimization of ergonomic risks. Criterion "C" (comparison) was not applied. Thus, the review question was outlined: "What strategies are recommended to minimize ergonomic risks in cleaning staff?".

The articles were selected between August and September of 2019, with advanced search in the bases: *Literatura Latino-Americana e do Caribe em Ciências da Saúde* (LILACS) (Latin American and Caribbean Literature in Health Sciences), Medical Literature Analysis and Retrieval System Online (MEDLINE) (via US National Library of Medicine - PubMed) and SciVerse Scopus (SCOPUS). The descriptors and their respective synonyms were selected through DeCS - *Descritores em Ciências da Saúde* (Descriptors in Health Sciences) and MeSH (Medical Subject Headings), respectively and combined using Boolean operators (OR/AND), to expand the possibility of finding studies that answered the review question (Chart 1).

Chart 1 - Search strategies in LILACS, MEDLINE (via PubMed) and SCOPUS databases. Municipality of Santa Maria, Rio Grande do Sul, Brazil, 2019

DATABASE	SEARCH STRATEGY
LILACS	((("ergonomia" OR "análise ergonômica" OR "avaliação ergonômica" OR "engenharia humana" OR "ergonomia cognitiva" OR "ergonomia física" OR "institucional ergonomia visual" OR "psicologia da engenharia")) AND (("serviço de limpeza")))
MEDLINE (via PUBMED)	
SCOPUS (Elsevier)	(TITLE-ABS-KEY (((("ergonomics" OR "ergonomic analysis" OR "ergonomic assessment" OR "human engineering" OR "cognitive ergonomics" OR "physical ergonomics" OR "institutional ergonomics" OR "visual ergonomics" OR "engineering psychology")) AND (((("housekeeping hospital" OR "housekeeping")))

Source: The authors (2019)

It was included original articles, in Portuguese, English, or Spanish, available online and that answered the review question. The study population was hospital cleaning staff, household, and company cleaning workers (offices, transport, hotels). No time frame was adopted, and duplicate articles were considered only once.

A double-independent selection of publishing was carried out as quality control, with subsequent checking of the inconsistencies and consensus among the parties. When there was a divergence, a third reviewer was asked. The productions were exported to Excel®, organized and summarized in a summary table having code, objective, country of origin, methodological design, level of evidence⁽²³⁾, ergonomic risk, minimization strategy, ergonomic analysis of work, and evaluation and/or results.

A positive strategy was considered when derived from experimental studies and with statistical significance to minimize ergonomic risks ($p < 0.05$) or Cohen's kappa coefficient (k) with an excellent agreement (0.4-0.75)⁽⁷⁾. The strategy was considered as recommended when derived from observational studies since it does not allow inferring causality.

The classification of levels of evidence was carried out according to the type of clinical issue, according to four classifications: treatment/intervention (evaluation of a clinical intervention); diagnosis/testing (confirmation of a certain phenomenon or exposure); prognosis, prediction or etiology (infer the etiology or the probability of the results); and, meaning (understanding of experiences or feelings around the disease)⁽²³⁾. The results are shown through descriptive analysis. Ethical aspects were respected, with a reliable citation of the authors' ideas, concepts, and definitions.

RESULTS

From the primary search, 227 studies were retrieved and, after applying the language filter, 213 studies were found. They were submitted to the reading of the titles and abstracts, with the exclusion of 186 studies and resulting in 27 studies. Subsequently, the productions were fully read, and the research corpus consisted of 21 articles. The exclusion of articles

without free access was done after the possibilities of getting them on the different open access internet sites were exhausted (Figure 1).

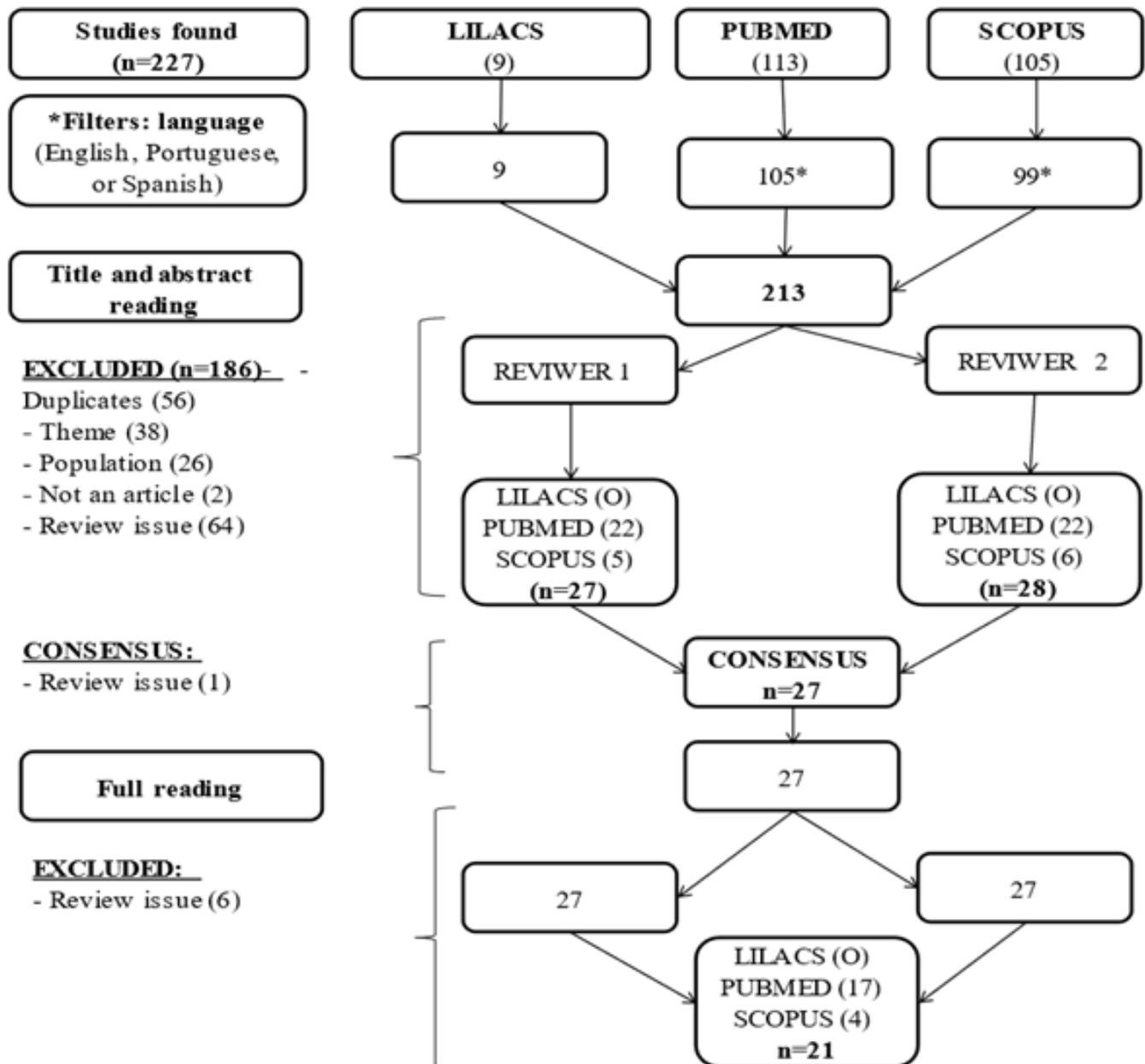


Figure 1 - Flowchart of the stages of double-independent selection of publishing to compose the final corpus (n=21). Municipality of Santa Maria, Rio Grande do Sul, Brazil, 2019

The corpus of analysis was composed of 21 articles, published from 1998 to 2018, with emphasis on the year 2012 (seven, 33.3%). Sweden had the highest number of publishing (eight, 38%). As for the population, it was highlighted studies with hospital cleaning staff (n=10; 47.6%) and companies (seven; 33.3%). The recommended strategies are described in Chart 2 and Chart 3.

Chart 2 - Characterization of the corpus of the integrative review analysis, according to objective, country of origin, design, and level of evidence. Municipality of Santa Maria, Rio Grande do Sul, Brazil, 2019 (continues)

Code	Objective	Country of origin	Design and Level of Evidence*
A1 ⁽³⁾	To compare analyzes for self-registration of arm elevation	Sweden	Randomized clinical trial LE=2*
A2 ⁽⁴⁾	To investigate the contribution of preventive intervention in the absence of disease in the company	Sweden	Quasi-experimental LE=3*
A3 ⁽²⁵⁾	To compare the effectiveness of aerobic exercise at work	Denmark	Randomized clinical trial LE=2*
A4 ⁽²⁹⁾	To analyze the effect of gender on work/family balance strategies and working hours	Canada	Mixed methods LE=6**
A5 ⁽⁵⁾	To investigate aerobic exercise to decrease musculoskeletal pain after 4 and 12 months	Denmark	Randomized clinical trial LE=2*
A6 ⁽²⁶⁾	To compare the effects of mop handle height on shoulder muscle activity and repetitive exertion	Finland	Randomized clinical trial LE=2*
A7 ⁽⁶⁾	To evaluate ergonomic problems in physical work and the association with tool design	Sweden	Randomized clinical trial LE=2*
A8 ⁽⁷⁾	Validate a health surveillance protocol for WRMD ⁺	Sweden	Randomized clinical trial LE=2*
A9 ⁽⁸⁾	To explore the prevalence of musculoskeletal symptoms, the interruption of normal activities and the association with ergonomic risk factors	Bangladesh	Transversal LE=4***
A10 ⁽⁹⁾	To compare the effectiveness of ergonomic education on muscle activity, postural and cardiovascular load during cleaning	Denmark	Randomized clinical trial LE=2*
A11 ⁽¹⁰⁾	To examine active coverage, regulatory compliance, frequency, and severity of losses by occupational injuries	United States of America	Prospective study LE=6*
A12 ⁽¹¹⁾	To identify the association between work activities and MSP ^s	Brazil	Transversal LE=6*
A13 ⁽¹²⁾	To investigate the relationship between WRMD ⁺ , muscle activity and postural load	Denmark	Randomized clinical trial LE=2*
A14 ⁽²⁴⁾	To analyze problems with the implementation and use of ergonomic and technical tools in the cleaning process	Sweden	Randomized clinical trial LE=2*
A15 ⁽¹³⁾	To analyze the risk of MSP ^s in the upper limbs during vacuuming	Australia	Transversal LE=6*
A16 ⁽¹⁴⁾	To compare mechanical work exposure based on occupational tasks	Sweden	Randomized clinical trial LE=2*
A17 ⁽¹⁵⁾	To analyze the validity of self-assessment reports on event and duration of tasks	Sweden	Mixed methods LE=6*
A18 ⁽¹⁶⁾	To evaluate the prevalence and factors associated with WRMD ⁺ on cleaning workers in a private hospital	India	Transversal LE=4***
A19 ⁽¹⁷⁾	To analyze the occupational health of Brazilian cleaners in Massachusetts	United States of America	Transversal LE=6*
A20 ⁽¹⁸⁾	To analyze differences in physical workload, psychosocial factors, and MSP ^s with the organizational factors of work	Sweden	Randomized clinical trial LE=2*

A21 ⁽²⁷⁾	To analyze gender organization and exposure to working among hospital cleaning staff	Canada	Mixed methods LE=6*
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*Level of evidence-based on the clinical issue of treatment/intervention⁽²³⁾. **Level of evidence-based on the clinical issue of diagnosis/testing⁽²³⁾. ***Level of evidence-based on the clinical issue of prognosis/etiology⁽²³⁾. +Work-related musculoskeletal disorder. [§]Musculoskeletal pain. (k) Cohen's kappa coefficient.

Source: The authors (2019)

Chart 3 - Characterization of the corpus of integrative review analysis, according to ergonomic risk, strategy, ergonomic analysis of the work and evaluation and results. Municipality of Santa Maria, Rio Grande do Sul, Brazil, 2019 (continues)

Code	Ergonomic risk	Strategy	Ergonomic work analysis	Evaluation and results
A1 ⁽³⁾	Lifting arm movement/ WRMD+	Risk assessment method (action levels)	Surveillance protocol in adverse ergonomic conditions, triaxial accelerometer and self-recording of arm elevation and speed	The strategy was positive: self-recording, in combination with activity levels, provide employers with a method for risk assessment as a solid basis for the prevention of WRMD+. In the control group, there was a difference between the two 9° arm elevation references ($p < 0.05$)
A2 ⁽⁴⁾	Physical effort and WRMD+	Ergonomic education, organizational measures, skills development, environmental measures of physical and psychosocial work	Protocol on costs and human resource accounting	The strategy was positive with an estimated net contribution of 605.6 Euros
A3 ⁽²⁵⁾	Physical effort	Aerobic exercise	Surface electromyography	The strategy was positive for greater work capacity of 0.59 ± 0.27 (95% IC; 0.05-1.13, $p = 0.03$) and significantly decreased the need for recovery by -11.0.
A4 ⁽²⁹⁾	Psychosocial factors: gender inequity and restricted work shift	Work/family balance strategy	Observation, interview, and task diary	It is recommended to create spaces for discussion about the balance between work and family, the circulation of information to reduce inequalities associated with gender/social status and family responsibilities.
A5 ⁽⁵⁾	Muscular physical effort and MSP [§]	Aerobic exercise and health support speeches	Questionnaire	The strategy of aerobic exercise, compared to speeches, was positive in reducing (>30%) the intensity of pain in the neck, shoulders, arms/wrists in the 12 months of follow-up ($p = 0.07$). However, pain in the lower extremities (knees) increased

A6 ⁽²⁶⁾	Shoulder muscle strain	Changes in work tools	Surface electromyography	The strategy was positive: the height of the adjusted mop handle had a statistically significant effect ($p < 0.001$) on the muscle activity of the shoulder or chin, compared to the eye level
A7 ⁽⁶⁾	Work tools design and WRMD ⁺	Changes in work tools	Observation	The strategy was positive: use of tools with better ergonomic design, long axis, or a wheelbarrow ($p < 0.001$)
A8 ⁽⁷⁾	WRMD ⁺ neck/shoulders area.	Health surveillance protocol	Health Surveillance Protocol in Adverse Ergonomics (HECO) and physical examination	The strategy was positive: effectiveness of the HECO protocol for one or more diagnoses in the neck (86%, $k \frac{1}{4} 0.62$)/shoulders and elbows/hands (84%, $k \frac{1}{4} 0.49$)
A9 ⁽⁸⁾	Physical effort and musculoskeletal symptoms in the upper limbs	Prevention: diagnosis and ergonomic care	Nordic Questionnaire	Support for ergonomic attention and interruption of regular activities is recommended
A10 ⁽⁹⁾	Physical effort, workload (postural and cardiovascular)	Ergonomic education	Observation, surface electromyography, electrocardiogram	The strategy was positive for a lower level of trapezius muscle activity ($p = 0.03$), lower range of motion and angular velocity of the trunk and lower cardiovascular load ($p = 0.02$)
A11 ⁽¹⁰⁾	Occupational injuries, tension, sprain, rise and fall	Ergonomic education	Inspection and interview	Participatory educational programs for the elimination of hazards are recommended; hiring ergonomists and protocols
A12 ⁽¹¹⁾	MSP ^s , awkward posture, manual cargo transportation and physical effort	Changes in work organization	The general risk assessment questionnaire	It is recommended to reduce the weight of the carts, keeping material replacement areas on each floor
A13 ⁽¹²⁾	Postural load, muscle activity and WRMD ⁺ on arms and shoulder	Ergonomic education with recordings	Surface electromyography, accelerometer, and the level of perceived pain	The strategy was positive: reduction of the event of WRMD in the lateral flexion angle ($p < 0.05$) Workers with low pain showed greater muscle activity during cleaning ($p < 0.05$)
A14 ⁽²⁴⁾	Physical effort	Changes in work tools	Surface electromyography, self-reported measures of comfort level, perceived effort (Borg scale) and interviews	The strategy was positive: decreased muscle activity when using the adjustable mop handle, compared to the non-adjustable mop: for the right deltoid muscle ($p = 0.003$), right trapezius muscle ($p = 0.000$) and left wrist extensors ($p = 0.004$)
A15 ⁽¹³⁾	Repetitive physical effort and MSP ^s in the upper limbs	Changes in work tools	Filming; risk assessment, rapid assessment of upper limbs (RULA)	It is recommended to use the vacuum cleaner in a backpack type machine ($p = 0.016$), compared to the box type ($p = 0.011$), with a greater risk of developing MSP.

A16 ⁽¹⁴⁾	Organizational factors, mechanical work, and MSP [§]	Exposure to work in tasks and based on occupation (working time and break)	Surface electromyography and observation	The strategy was positive: the interval/pause was significant for both groups in reducing MSP ($p=0.002$)
A17 ⁽¹⁵⁾	Physical workload and WRMD ⁺	Task diary	Interview and observation	The disparity between the number of reported and observed tasks, underestimating the duration of breaks and less time-consuming activities
A18 ⁽¹⁶⁾	WRMD ⁺	Ergonomic education	Nordic Questionnaire	A significant association between WRMD and the increased hours and years of work ($p<0.05$). Ergonomic education, job rotation and physiotherapy are recommended
A19 ⁽¹⁷⁾	Uncomfortable working postures, lifting objects and MSP [§]	Changes in the organization and work tools	Questionnaire	It is recommended to use ergonomic equipment, comfortable protective equipment (shoes) and work organization (task rotation, a decrease of workload, breaks and improvement in social relationships)
A20 ⁽¹⁸⁾	Physical effort, workload, psychosocial factors, and MSP [§]	Organizational factors of work	Nordic Questionnaire; medical and physiotherapist evaluation; pedometer; tilt sensor; heart rate; surface electromyography	The strategy was positive: the group with the organization (intervention) had a lower physical load, heart rate, positions and movements of the head, arms ($p<0.001$) and wrist ($p=0.001$) than the control group. The prevalence of MSP [§] on neck/shoulders was lower in the intervention group ($p=0,04$)
A21 ⁽²⁷⁾	Organizational factors and workload	Exposure to light and heavy work and separated by gender	Observation and interview	It is recommended to assign tasks by sex for excessive work demands, which would be better handled by task redesign

Source: The authors (2019)

The prevalent ergonomic risks were related to physical effort^(8-9,11,13,18,24-26) (eight; 43%) and musculoskeletal symptoms (musculoskeletal pain related to work/WRMD, musculoskeletal pain/MSP)^(3-8,10-18,26) ($n=15$; 71.4%).

In clinical trials^(3,5-7,9,12,14,18,24-26) and in the quasi-experimental study⁽⁴⁾, the effectiveness of strategies to minimize ergonomic risks was identified. Among them, the following prevailed and were effective: the ergonomic education^(4,9-10,12,16) (five; 23.8%); changes in work tools^(6,11,13,17,24,26) (six; 28.5%) and doing aerobic exercise^(5,25) (two; 9.5%).

In cross-sectional^(8-9,11,13,16-17) and prospective studies⁽¹⁰⁾, the association between prevention measures (diagnosis and ergonomic care), promotion measures (ergonomic education) was identified^(8-9,16), changes in work organization^(11,13,17) and minimization of ergonomic risks ($p<0.005$). On the mixed method^(15,27-28), the identification of the organization and the determinants of the work activity⁽²⁸⁾, of the task diary^(15,28) and the division of labor into a light and heavy⁽²⁷⁾ as promising strategies for minimizing ergonomic risks were evident.

As for the level of evidence⁽²³⁾, intervention studies with level 2 of evidence prevailed (n=11; 52%)^(3,5-7,9,12,14,18,24-26) and level 3 (one; 5%)⁽⁴⁾. After, diagnostic studies (level 6)^(8,10-11,13,15-17,27-28) (nine; 43%) and prognostics (level 4)^(8,10) (two; 9.5%).

DISCUSSION

Characterization of ergonomic risks in cleaning staff

Research on ergonomic risks has been a trend for the past six years (from the year 2012 to the year 2018)^(2-3,5-13,16-17,20,24-26,28-31). However, in Brazil, few studies with cleaning workers are observed^(1-2,11,20,29,31), reflecting a lack of recognition and appreciation^(24,31) and its invisibility in the hospital^(5,31) and institutional scenario⁽²⁴⁾.

Studies with hospital cleaning staff^(5,7,10,13-16,24,26-27), showing a high exposure to ergonomic risks, high physical demands, repetitive movements, high static muscle loads, and inadequate postures⁽¹⁷⁾ predominated. The consequences include the high prevalence of musculoskeletal disorders and workload⁽¹⁸⁾, with a negative impact on the quality of life. For institutions, they include significant costs⁽¹⁾ and a drop in the quality of services performed (absences, sick leave, and other types of work leave)⁽¹⁵⁾.

The work settings of hospital cleaning staff are wards, halls and other units inside the hospital, performing light and heavy duties⁽²⁷⁾. The first is characterized by neutral postures, walking, repetitive movements of the upper limbs' joints, handling one to six kg a mop (wet or dry). The second is characterized by bent postures, rapid repetitive movements, involving the upper limbs' joints and light weights (dust) or weights from one to three kg (emptying wastebaskets)⁽²⁷⁾.

The panorama of ergonomic risks in cleaning work showed that negative ergonomic aspects are associated with the development or worsening of musculoskeletal symptoms^(3-8,10-18,26). This association takes place because the sanitation and cleaning activities are performed manually, with repetitive movements, with the use of physical effort and equipment not adapted to the psychophysiological needs of the worker, besides insufficient rest, shifts, and unwell distributed workload^(8,12). As a result, there are accidents at work, decreased functional capacity, implications for quality of life, and WRMD^(3-8,10-18,26).

In a study, the prevalence of MSP in hospital cleaning staff, in the last seven days, was 70.1%⁽²⁹⁾. From these, 25.5% reported pain from strong to unbearable intensity. It was also found that those with a higher prevalence of MSP had lower scores in the dimensions of quality of life⁽²⁹⁾.

Furthermore, repetitive movements, physical effort^(8-9,11,13,18,24-26) and the physical/postural workload^(12,15,17,27) comprise ergonomic risks in the activities of cleaning environments, rooms and bathrooms. These are caused by the inadequate posture in the leaning to clean, requiring low back bending; the manual transport of loads and the use of physical force in the upper limbs. Physical effort was associated with underestimating the time of breaks at work, being higher among cleaning staff than in-office workers⁽¹⁶⁾.

Additional factors were highlighted in the exposure to ergonomic risks, including: organizational^(17-18,24,27), work environment⁽²⁴⁾ and psychosocial^(18,28). Therefore, changes in work organization must be expanded, prioritizing the development of skills⁽⁴⁾, dimensioning⁽²⁴⁾, task rotation⁽²⁴⁾, redesigning the assignment of tasks by sex⁽²⁷⁾; planning and execution of work breaks^(13-17,24) and maintenance of supply replacement areas on each floor⁽¹¹⁾. Thus, it is possible to reduce the physical workload and relieve the MSP^(11,24).

As for the psychosocial factors at work^(18,28), they are defined as the interaction among

work content, organizational and environmental conditions, worker's skills, and individual demands⁽³⁰⁾. These interactions can lead to stress⁽²⁴⁾, lack of recognition⁽²⁴⁾, devaluation⁽²⁴⁾, gender inequality⁽²⁸⁾, a deficit in social support⁽¹⁸⁾, depending on how the cleaning staff experiences them.

Strategies for minimizing ergonomic risks in cleaning staff

This evidence synthesis recommends the use of ergonomic education as an effective strategy, mainly related to musculoskeletal symptoms^(3-8,10-18,24). This strategy proved to be effective in reducing absenteeism related to the events of WRMD⁽⁴⁾; at the lowest level of muscle activity of the trapezius on both sides ($p=0.03$), at the lowest range of motion and angular velocity of the trunk, and the lowest cardiovascular load ($p=0.02$)⁽⁸⁾; eliminating hazards in the work process⁽¹⁰⁾ and reducing WRMD⁽¹⁶⁾.

It was evidenced that ergonomic education simplifies the change in workers' behavior through self-care actions⁽²⁸⁾. It can be accomplished through verbal and visual instructions about ergonomics⁽¹⁰⁾; health education on appropriate body postures and equipment handling⁽¹⁷⁾; massages; physical exercises, among others⁽¹⁰⁾.

As for the effects of guidelines about ergonomics^(9-10,17), regarding the daily cleaning routine (sweeping, transporting garbage, and cleaning surfaces), it was observed multiple musculoskeletal and cardiovascular benefits⁽⁹⁾. It is highlighted the decrease of the general workload, motivation to a more complex pattern of muscular activity, less range of motion and angular velocity of the trunk, less cardiovascular load⁽⁹⁾, and increased awareness about individual care⁽¹⁰⁾.

Regarding the equipment (washing machines and extractors, vacuum cleaners, mops, buckets, cloths, squeezers, polishers, abrasive discs and cars for transporting waste)⁽³²⁾, the *Agência Nacional de Vigilância Sanitária* (National Health Surveillance Agency) (ANVISA) does not specify which preventive actions context of ergonomics, can be adopted in the use of this equipment⁽³²⁾. This synthesis recommends changes with the use of equipment with better ergonomic design and an inter-functional layout^(6,11,13,17,24,26). They include: long sticks or carriages ($p<0.001$)⁽⁶⁾; the use of the box-type vacuum cleaner machine ($p=0.011$) compared to the backpack-type machine ($p=0.016$)⁽¹³⁾, the low weight of the functional and waste transport carriages⁽¹¹⁾ and mop with the adjustable stick^(24,26).

Evidence points to the mop as the most common work equipment in cleaning^(9,11,24,26). Use optimization and an easily adjustable stick are recommended⁽²⁶⁾. Such measure may be effective in reducing muscle demand, due to the excessive use of the shoulder or chin muscles, in comparison with the eye level ($p<0.001$)⁽²⁶⁾ and in comparison with the non-adjustable mop for the right deltoid muscle ($p=0.003$); right trapezius muscle ($p=0.000$) and left wrist extensors ($p=0.004$), achieving an average comfort level of 4.93 and less effort⁽²⁴⁾. Thus, a holistic approach is needed to improve the benefits of tools and techniques in cleaning work, as the mop implementation and contextualization are important⁽¹¹⁾.

The strategy of doing the aerobic exercise^(5,25) was performed in four⁽⁵⁾ and 12 months^(5,25), proving to be effective for: an increase in working capacity of 0.59 ± 0.27 points (95% IC; 0.05-1.13, $p=0.03$)⁽²⁵⁾, decreased demand for recovery⁽²⁵⁾, productivity, identification of the organization and determinants of work activity⁽⁵⁾. When performed in four months, aerobic exercise was effective in significantly reducing in the exercise group (>30%), the intensity of MSP in the neck, shoulders, arms/wrists⁽⁵⁾. This trend was kept for the following 12 months ($p=0.04$).

However, as an unintended effect, the physical exercise provided an increase in pain intensity in the lower extremities⁽⁵⁾ did not affect on the perceived effort and productivity, with a tendency for a greater effect of aerobic exercise among younger workers⁽²⁵⁾. Consequently, it is recommended that aerobic exercises be performed as part of the workday⁽²⁵⁾, with exercise adaptation, to keep only the positive effect on the MSP⁽⁵⁾.

As a limitation of this review, the difficulty in comparing the results related to the ergonomic risks, before and after carrying out the strategies, considering the heterogeneity concerning the presentation of the results; as well as parameters and scales.

CONCLUSION

This synthesis of evidence recommends the use of ergonomic education strategies, changes in work tools, aerobic exercise, risk assessment method, ergonomics surveillance protocol, task diary; besides the contextualization with the organizational and psychosocial factors of work.

The evidenced strategies proved to be effective and may contribute to the area of health in the promotion and recovery of physical conditions of cleaning staff.

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