

Association between musculoskeletal pain and telework in the context of the COVID-19 pandemic: an integrative review

Associação entre dor musculoesquelética e teletrabalho no contexto da pandemia de COVID-19: uma revisão integrativa

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ABSTRACT | Introduction: Telework has been an alternative for companies to remain active in the market during the coronavirus disease 2019 (COVID-19) pandemic. **Objectives:** To analyze the main scientific evidence on the association between musculoskeletal pain and home office work during the COVID-19 pandemic. **Methods:** This is an integrative review guided by the following question: can workers present musculoskeletal pain due to home office work during the COVID-19 pandemic? The searches were conducted on the bases of dados MEDLINE (via PubMed), Cochrane Library, Scopus (Elsevier), Web of Science, Taylor & Francis, Embase, LILACS and SciELO databases. The study included articles published from March 2020 until the time of data collection, which occurred on April 20th, 2021. **Results:** The main findings showed complaints of increased musculoskeletal pain, especially in the low back region, followed by neck, except for a study in which the participants increased the number of hours of physical activity during the pandemic. Increased sedentary lifestyle, poor posture, and increased physical load due to household chores seemed to promote the onset of musculoskeletal disorders. The point prevalence of neck pain was significantly related to age, sex, health status, job satisfaction, and length of employment. The findings provided evidence that the impact on work and leisure was substantial. **Conclusions:** The pandemic worsened the musculoskeletal health of workers in different areas whose work activities were kept at home in the remote mode. However, engagement in physical activity during confinement periods was beneficial for reducing the prevalence of musculoskeletal pain.

Keywords | workers; telework; musculoskeletal pain; cumulative traumatic disorders; pandemics.

RESUMO | Introdução: O teletrabalho tem sido uma alternativa para as empresas se manterem ativas no mercado durante a pandemia da doença do coronavírus 2019 (COVID-19). **Objetivos:** Analisar as principais evidências científicas sobre a associação entre dor musculoesquelética e trabalho em *home office* durante a pandemia de COVID-19. **Métodos:** Revisão integrativa, conduzida pela seguinte questão: os trabalhadores podem apresentar dor musculoesquelética em virtude do trabalho em *home office* durante a pandemia de COVID-19? As pesquisas foram realizadas nas bases de dados MEDLINE (via PubMed), Cochrane Library, Scopus (Elsevier), Web of Science, Taylor & Francis, Embase, LILACS e SciELO. Foram incluídos artigos publicados de março de 2020 até o momento da coleta, que ocorreu em 20 de abril de 2021. **Resultados:** Os principais achados evidenciaram queixas de aumento das dores musculoesqueléticas, principalmente na região lombar, seguida da região cervical, exceto em um estudo no qual os participantes aumentaram as horas de prática de atividade física durante a pandemia. O aumento do sedentarismo, a má postura e o aumento da carga física devido às tarefas domésticas pareceram promover o aparecimento de distúrbios musculoesqueléticos. A prevalência pontual de dor no pescoço foi significativamente relacionada a idade, sexo, estado de saúde, satisfação no trabalho e tempo de trabalho. Os achados forneceram evidências de que o impacto no trabalho e no lazer foi substancial. **Conclusões:** A pandemia piorou a saúde osteomuscular de trabalhadores de diversas áreas cujas atividades laborais foram mantidas em casa na modalidade remota. Todavia, a realização de atividade física durante os períodos de confinamento foi benéfica para a redução da prevalência das referidas dores.

Palavras-chave | trabalhadores; teletrabalho; dor musculoesquelética; transtornos traumáticos cumulativos; pandemias.

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INTRODUCTION

In 2020, the world was surprised by the crisis resulting from the coronavirus disease 2019 (COVID-19), a highly contagious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The infection was characterized by the World Health Organization (WHO) as a pandemic due to the worldwide extent of the outbreak that emerged in the first semester of 2020.¹ Some main measures adopted to contain the virus and minimize the likelihood of contamination are social distancing, isolation, quarantine, and community containment.²

Given the implementation of these measures, home office work, also known as telework, has been an alternative for companies to remain active in the market during the pandemic, since employees have not been able to work at employer's facilities^{3,4} due to risk of contagion by COVID-19. Therefore, home office work represented an alternative to preserve workers' health, since, at the end of March 2020, it was estimated that more than 3.4 billion people in 84 countries were confined to their homes.⁵

Recently, due to the decree of public calamity in the Brazil, the provisional executive orders 927 and 936 of 2020 and, subsequently, Law no. 14,020 of 2020 addressed telework, remote work, and distance working.⁶ The aim of this legislation was to contemplate companies and workers that had to change their work mode due to the pandemic, to enable the implementation of the remote work model during this period, and to present an alternative that would assist organizations in facing the crisis and in avoiding crowded places.⁴

Workers and companies are still in the process of adapting and learning how to deal with all the changes caused by the pandemic. In this scenario, an essential premise stands out with regard to telework, known as ergonomics, which studies the adaptation of work to individuals in order to preserve workers' health and well-being.⁷ There are evidence that ergonomic conditions in the work environment determine workers' musculoskeletal health.⁸ In this sense, musculoskeletal pain consists of any acute and chronic painful experience related to injuries or disorders of

the musculoskeletal system, except for pain of systemic, neurologic, or severe local origin.⁹ Furthermore, the subjective nature of this pain, related both to individual characteristics and to those of their occupation, may explain the prevalence of pain and musculoskeletal disorders (MSDs) among workers.¹⁰

Work-related MSDs are one of the most severe public health problems worldwide, being caused by the excessive use of certain muscle groups due to several factors, such as biomechanical, organizational, and psychosocial ones.^{7,11} These disorders are one of the main causes of absenteeism and occupational disability, resulting in high costs for the society.^{12,13} Therefore, if companies do not adjust domestic environments ergonomically, several individuals working at home during social confinement caused by the COVID-19 pandemic are prone to musculoskeletal pain.⁸ Additionally, evidence on the characterization of domestic workers with regard to negative work-related health outcomes is incipient.¹⁴

Information obtained in this research is proposed to elucidate the reality of individuals working at home and to promote a culture of preventive actions of surveillance, monitoring, assessment, and early intervention, in order to promote the occupational health of these workers. Therefore, the aim of this study was to analyze the main scientific evidence on the association between musculoskeletal pain and working from home during the COVID-19 pandemic.

METHODS

This is an integrative review conducted in six stages: development of review protocol, definition of the guiding question and strategies for search and selection of articles, critical analysis of studies, data collection, data interpretation, and synthesis of results.¹⁵ The study followed the recommendations established in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA).¹⁶

For conducting the research, the following question was raised: can workers present musculoskeletal pain due to working from home during the COVID-19 pandemic? Based on this guiding question, the PVO

acronym – population, variables, and outcomes – was used to assist in the definition of descriptors, as shown in Chart 1.

The search for primary studies was conducted in April 2021, in a paired manner between the author, on the MEDLINE (via PubMed), Cochrane Library, Scopus (Elsevier), Web of Science, Taylor & Francis, Embase, Latin American and Caribbean Health Sciences Literature (LILACS), and SciELO databases, using the terms included in the Health Sciences Descriptors (Descritores em Ciências da Saúde, DeCS) e no Medical Subject Headings (MeSH), as well as

their synonymous. The strategy (Musculoskeletal Pain OR Musculoskeletal Pains) AND (Telework OR Teleworking OR Flexible Workplace OR Flexible Workplaces OR Remote Working OR Telecommuting OR Home office OR “Working from home”) was employed in all databases (Chart 2). The use of the Mendeley Desktop[®] software made it possible to manage references, thus identifying and excluding duplicate studies.

Inclusion criteria were original articles published and fully available in all languages, after the beginning of the pandemic (March 2020 up to the day of collection, i.e., April 20th, 2021). Exclusion criteria were literature review articles, meta-analyses, monographs, dissertations, and reports.

Since the focus of this research was conducting an integrative review that aimed to analyze secondary data, the present study was waived from approval of the Research Ethics Committee. Furthermore, we sought to maintain the authenticity of ideas, concepts and definitions proposed by the authors of the articles.

Chart 1. PVO acronym to obtain descriptors

Acronym	DeCS/keyword	MeSH
Population	Workers	Workers
Variables	Telework	Teleworking
Outcomes	Musculoskeletal pain	Musculoskeletal pain

DeCS = Health Sciences Descriptors (Descritores em Ciências da Saúde);
MeSH = Medical Subject Headings.

Chart 2. Strategies for article search on databases

Database	Search strategy
PubMed	(Musculoskeletal Pain OR Musculoskeletal Pains) AND (teamwork OR term working OR Flexible Workplace OR Flexible Workplaces OR Remote Working OR Telecommuting OR Home office OR “Working from home”)
Cochrane Library	(Musculoskeletal Pain OR Musculoskeletal Pains) AND (Telework OR Teleworking OR Flexible Workplace OR Flexible Workplaces OR Remote Working OR Telecommuting OR Home office OR “Working from home”) in All Text
Scopus	ALL ((musculoskeletal AND pain OR musculoskeletal AND pains) AND (telework OR teleworking OR flexible AND workplace OR flexible AND workplaces OR remote AND working OR telecommuting OR home AND office OR “working AND from AND home”)) AND (LIMIT-TO (PUBYEAR , 2021) OR LIMIT-TO (PUBYEAR , 2020)) AND (LIMIT-TO (DOCTYPE , “ar”))
Web of Science	ALL FIELDS: ((Musculoskeletal Pain OR Musculoskeletal Pains) AND (Telework OR Teleworking OR Flexible Workplace OR Flexible Workplaces OR Remote Working OR Telecommuting OR Home office OR “Working from home”))
Taylor & Francis	[All: musculoskeletal] AND [[All: pain] OR [All: musculoskeletal]] AND [All: pains] AND [[All: telework] OR [All: teleworking] OR [All: flexible]] AND [[All: workplace] OR [All: flexible]] AND [[All: workplaces] OR [All: remote]] AND [[All: working] OR [All: telecommuting] OR [All: home]] AND [[All: office] OR [All: “working from home”]] AND [Publication Date: (01/01/2020 TO 12/31/2021)]
Embase	(‘musculoskeletal pain’/exp OR ‘musculoskeletal pain’ OR (musculoskeletal AND (‘pain’/exp OR pain)) OR ‘musculoskeletal pains’ OR (musculoskeletal AND pains)) AND (‘telework’/exp OR telework OR ‘teleworking’/exp OR teleworking OR ‘flexible workplace’ OR (flexible AND (‘workplace’/exp OR workplace)) OR ‘flexible workplaces’ OR (flexible AND workplaces) OR ‘remote working’/exp OR ‘remote working’ OR (remote AND working) OR ‘telecommuting’/exp OR telecommuting OR ‘home office’ OR ((‘home’/exp OR home) AND (‘office’/exp OR office)) OR ‘working from home’)
LILACS	(Musculoskeletal Pain OR Musculoskeletal Pains) AND (Telework OR Teleworking OR Flexible Workplace OR Flexible Workplaces OR Remote Working OR Telecommuting OR Home office OR “Working from home”)
SciELO	(Musculoskeletal Pain OR Musculoskeletal Pains) AND (Telework OR Teleworking OR Flexible Workplace OR Flexible Workplaces OR Remote Working OR Telecommuting OR Home office OR “Working from home”)

LILACS = Latin American and Caribbean Health Sciences Literature.

RESULTS

Based on the search on all fields of the databases and on the references of the retrieved studies, 177 studies were found. The stage of article identification occurred, firstly, by reading of titles and, then, of abstracts. The articles that met inclusion criteria were read in full,

resulting in the inclusion of eight articles according to eligibility criteria (Figure 1).

The results of the present study are shown in Table 1. Main information was grouped and organized in descending order according to year of publication, with authors' names, article title, journal name, objective, and main results.

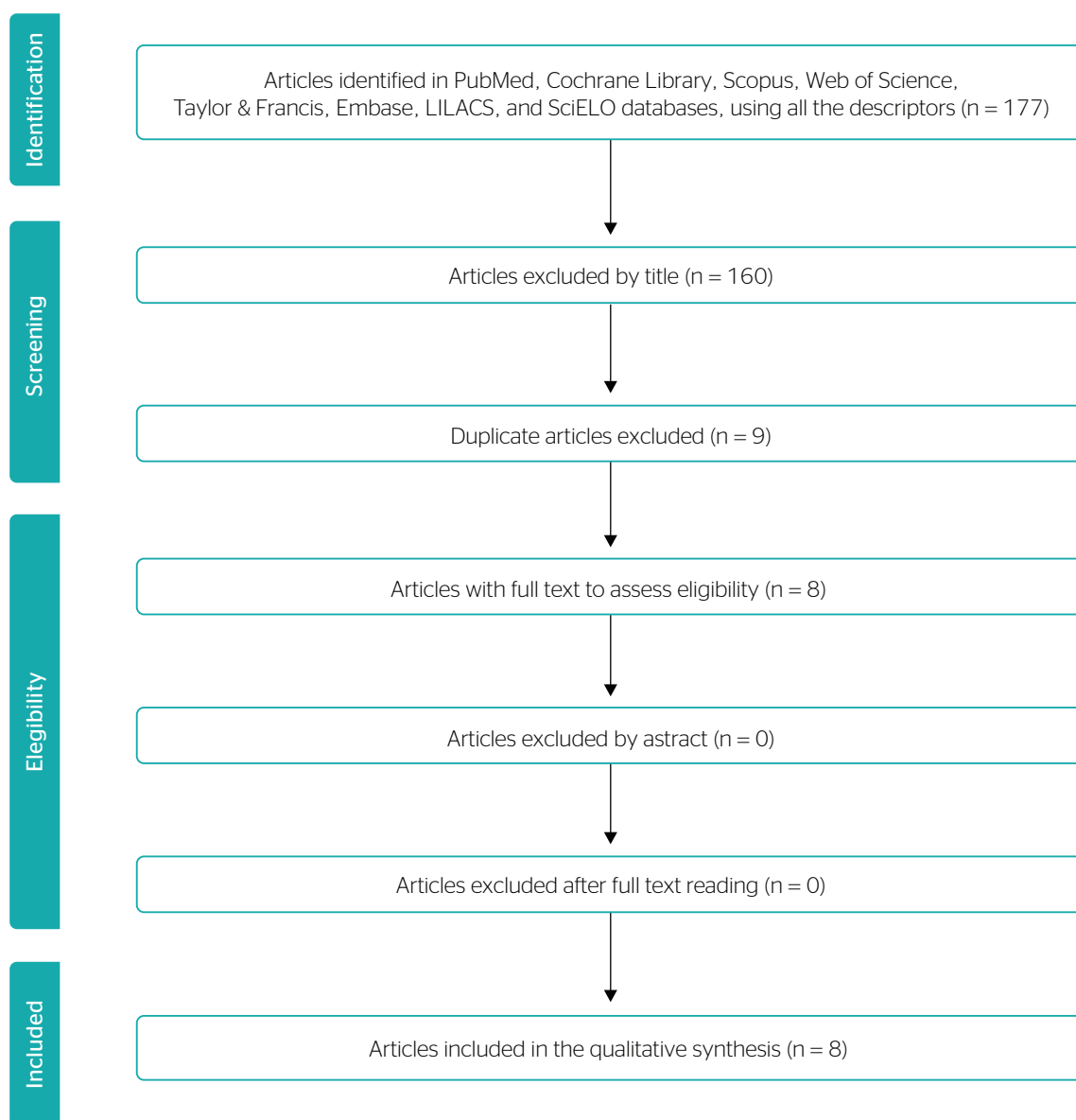


Figure 1. Flow chart and inclusion and selection criteria for articles.

Table 1. Characteristics of articles that compose the integrative review, Recife, state of Pernambuco, Brazil, 2020

Author	Title	Journal	Objective	Results
Moretti et al. ¹⁴	Characterization of home working population during COVID-19 emergency: a cross-sectional analysis	<i>International Journal of Environmental Research and Public Health</i>	To examine the impact of home working on perceived job productivity and satisfaction, work-related stress, and musculoskeletal issues.	Low back pain was referred by 41.2% of workers, and neck pain by 23.5% of them. Neck pain worsened in 50% of home workers, while low back pain did not exacerbate in 47.6% of cases. Workers with musculoskeletal pain reported a lower job satisfaction. Concerning physical health issues related to remote working, increased sedentary lifestyle and poor posture seemed to promote the onset of musculoskeletal disorders, particularly low back pain and neck pain.
Verma et al. ¹⁸	Prevalence of work from home on female-it workers, on neck pain and its psycho-social effects during epidemic period	<i>Medico-Legal Update</i>	To identify the impact of neck pain and leisure activity on female information technology workers who remained working during confinement and to analyze psychosocial effect on neck pain.	The point prevalence of neck pain was significantly related to age, sex, health status, job satisfaction, and length of employment. The findings provided evidence that the impact on work and leisure was substantial.
Gerding et al. ²⁰	An assessment of ergonomic issues in the home offices of university employees sent home due to the COVID-19 pandemic	<i>Work</i>	To examine faculty, staff, and administrators of a large university with regard to home office, specifically ergonomic stressors and muscle discomfort, to characterize the prevalence of these stressors and of this discomfort.	Over 40% of the participants reported moderate to severe discomfort (severe low middle back pain, moderate discomfort in eyes/neck/head, and discomfort in the upper back/shoulders). Laptops (always and often) were widely used (85%), with most respondents using the laptop monitor (55%). Furthermore, less than 45% of the seating conditions had adjustable arm rests.
Siqueira et al. ²²	Vocal self-perception of home office workers during the COVID-19 pandemic	<i>Journal of Voice</i>	To investigate the self-perception of vocal fatigue symptoms and musculoskeletal pain in home office workers before and during the COVID-19 pandemic.	The experimental group (EG), which worked from home, reported more vocal fatigue symptoms and musculoskeletal pain than the control group (CG), which continued to work in person before the pandemic. However, during the pandemic, the EG presented a higher frequency of pain in the posterior portion of the neck, shoulder, upper back, and temporal and masseter muscles, while the EG presented a higher frequency of pain in the larynx.
Sharma & Vaish ²⁴	Impact of COVID-19 on mental health and physical load on women professionals: an online cross-sectional survey	<i>Health Care for Women International</i>	To assess physical and mental loads on Indian women professionals during lockdown due to COVID-19.	There was a 34.3% increase in the physical load of Indian women professionals due to household chores during lockdown. A total of 45.81% reported pain in neck and back region, and 36.31% reported strain in their eyes occasionally. Mental health was moderately and severely affected in 27.5 and 27% of participants, respectively.
Celenay et al. ³¹	Coronaphobia, musculoskeletal pain, and sleep quality in stay-at home and continued working persons during the 3-month COVID-19 pandemic lockdown in Turkey	<i>Chronobiology International</i>	To compare the effects of a 3-month nationwide lockdown in Turkey on musculoskeletal pain, coronaphobia, and sleep quality in individuals who stayed at home (SH) and in those who continued to work (CW) during the COVID-19 pandemic.	During the 3-month lockdown, low back pain was higher in the SH group than CW group ($p < 0.05$). The rates of pain in the neck, upper back, shoulder and hip/thigh were lower and the rate of low back pain was higher in the CP group ($p < 0.05$); while pain rates in the neck, upper back, shoulder and elbow were lower in the CT group ($p < 0.05$) during covid-19 pandemic block than before. Sleep quality was similar in both groups ($p > 0.05$). Individuals who SH reported more low back pain and higher coronaphobia than individuals who CW during the 3-month lockdown caused by the COVID-19 pandemic.

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Table 1. Continued

Author	Title	Journal	Objective	Results
Šagát et al. ³²	Impact of COVID-19 quarantine on low back pain intensity, prevalence, and associated risk factors among adult citizens residing in Riyadh (Saudi Arabia): a cross-sectional study	<i>International Journal of Environmental Research and Public Health</i>	To estimate the effect of quarantine on low back pain intensity, prevalence, and risk factors among adults living in Riyadh (Saudi Arabia)	Significant differences in the low back pain intensity were observed between individuals who underwent teleworking and the subject who did not during quarantine ($p = 0.001$), but not before the quarantine. Furthermore, those survey respondents who were moving always or most of the time reported a significant lower low back pain intensity, both before ($p = 0.046$) and during the quarantine ($p < 0.001$), than individuals who were sitting all the time or most of the time.
Rodríguez-Nogueira et al. ³³	Musculoskeletal pain and teleworking in times of the COVID-19: analysis of the impact on the workers at two Spanish universities	<i>International Journal of Environmental Research and Public Health</i>	To analyze the impact of the confinement on the musculoskeletal health of the staff of two Spanish universities	The prevalence of musculoskeletal pain among the University workers studied appears to have reduced during the time in which they were confined and carrying out telework in all cases ($p < 0.001$). At the same time, workers modified their physical activity habits as regards frequency and the type of activities carried out, showing a significant increase during the confinement period ($p < 0.04$), especially among women.

COVID-19 = coronavirus disease 2019.

DISCUSSION

All articles included in the qualitative synthesis of this review are international and present risk factors and prevalence of musculoskeletal pain in the home office work context and how this type of work may interfere with productivity, satisfaction, and stress. Furthermore, these articles address the benefits of physical activity for musculoskeletal health during the COVID-19 pandemic confinement.

Home office work may bring some psychological benefits, such as greater work-related flow and greater workers engagement, in addition to promoting connectivity among the staff.¹⁷ It may be especially positive for workers who are caregivers of their children or of family members, leading to a better balance between personal and professional life; conversely, it also results in little time for leisure activities.^{18,19} Nonetheless, the home environment does not guarantee appropriate facilities and equipment, increasing the ergonomic and, consequently, the psychosocial risk of workers, due to a longer exposure time.

However, the provision, by the company, of infrastructure and technological ergonomic resources for the performance of remote work using information and communication technologies may assist in the activities to be executed and in maintaining a healthy workforce.²⁰ The process of transition between regular and remote work, in addition to guidance to workers, should consider the adaptation of the domestic environment and of work instruments, the establishment of rigid routines, and the development of skills such as persistence, autonomy, and discipline may contribute to the adaptation to remote work.²¹

Similarly, the excessive use of devices such as laptops, keyboard, mouse, tablets, and smartphones may cause problems related to repetitive stress.^{20,22,23} These reasons, together with increased physical and mental workload due to domestic activities and to care for children and for shared household spaces, contribute for the development of MSDs²⁴ and emotional disorders among teleworkers. The development of these disorders interferes with job productivity and quality of life,²⁵ causing lower levels of well-being and greater work fatigue and burnout.²⁶

With regard to the relationship between musculoskeletal pain and stress, occupational stress is a real problem, and neglecting its effect on MSDs has contributed to the growing incidence of these conditions.²⁷ This corroborates a research conducted by Almeida & Dumith,²⁸ which revealed a high prevalence of musculoskeletal symptoms in a sample composed of servants at a university, in addition to a strong association between perceived stress and the presence of these symptoms.

In this sense, Moretti et al.¹⁴ revealed the impact of remote work in results related to work, mental health, and musculoskeletal symptoms. Home office workers perceived themselves as less productive, less stressed, and equally satisfied compared to the time of office working. However, workers with musculoskeletal pain reported a lower job satisfaction. Most participants complained of worsening of neck pain, but no exacerbation of low back pain was reported. This may be explained by the fact that complaints of neck pain are more common in sedentary workplaces.²⁹

According to Siqueira et al.,²² neck pain was also reported by workers who performed their activities in home offices, which is consistent with other studies.^{18,30} Furthermore, there was an increase in the frequency of pain in shoulder, upper back, and temporal regions during the pandemic. These findings may be attributed to home ergonomics, which may not be the most appropriate one, as well as to the maintenance of static postures for long periods.²⁰ In this study, it was also observed that home office workers are at risk of developing vocal disorders, because there is a higher demand for vocal meetings via digital platforms or devices, connected with the use of headphones and/or microphones, in order to allow for the interaction between company, staff, and customers.

In the study by Celenay et al.,³¹ individuals who remained on remote work had more low back pain compared to those who continued working outside home during COVID-19 lockdown. This corroborates a study by Šagát et al.,³² in which the intensity of low back pain increased significantly during the quarantine among those individuals who were aged from 35 to 49 years old, had a body mass index equal to or exceeding 30, underwent higher levels of stress, did not comply

with ergonomic recommendations, were sitting for long periods, did not practice enough physical activity, and underwent teleworking or distance learning.

It should be noted that the most significant musculoskeletal pain in home office workers is low back pain, related to sedentary occupational activities performed by white-collar workers. Low back pain results from inadequate postures, repetitive and monotonous tasks, excessive working hours and lack of breaks, inadequate furniture and equipment, difficulties in interpersonal relationships, pressure from the leadership, among others.²⁰ If it persists, pain associated with MSDs may cause future chronic injuries, such as tendinitis, which may reduce work performance and lead to absenteeism.³³

Social isolation has influenced in the practice of regular physical activity. According to Šagát et al.,³² the percentage of subjects who did not practice physical activity or who practiced it only once a week significantly increased. Moreover, the number of individuals who practiced physical activity twice, three, six or seven times a week significantly decreased. Similarly, all respondents reported increased stress.

However, physical activity practice has been beneficial in mitigating the implications to workers' physical and mental health in times of pandemic. Accordingly, in the study by Rodríguez-Nogueira et al.,³³ there was a decrease in the prevalence of musculoskeletal pain, due to the increased frequency of physical activity during the quarantine, especially among women. There was also a change in the type of physical activity done, with a preference for aerobic activities before the confinement and strength training and stretching exercises during this period.

Therefore, the performance of physical activity in a proper and adequate manner may control musculoskeletal pain. Resistance exercises may reduce musculoskeletal, neck, and low back pain, provided that they are performed for a period longer than 10 weeks and were supervised.²⁹ Furthermore, it would be interesting to early identify symptoms in home office workers, in order to minimize and prevent injuries and complications. A strategy to achieve this goal would be performing scheduled breaks, as well as practicing exercised with supervision, thus reducing sedentary

lifestyle – which contribute to intensification of musculoskeletal pain – and, consequently, improving quality of life and job productivity.³⁴

CONCLUSIONS

The pandemic has worsened the musculoskeletal health of workers in different areas whose work activities were performed remotely. The studies included in this review revealed increased prevalence of musculoskeletal pain in various body regions, especially lower back and neck, related to factors such as stress, difficulties in balancing family and professional demands, reduced neck motion, inadequate posture and furniture, changes in muscle activity, heavy workload, and sedentary lifestyle. However, engagement in physical activity during the confinement period was beneficial to the

maintenance of well-being and health, in addition to reduce the prevalence of musculoskeletal pain.

AUTHOR CONTRIBUTIONS

INS was responsible for the project administration, conceptualization, investigation, formal analysis, and writing – original draft. MLP participated in the study visualization, methodology and writing – original draft. AMBS participated in the study investigation formal analysis and data curation. GAR participou in the study investigation, resources, and writing – review & editing. ASO participated in the study supervision, validation, and writing – review & editing. All authors have read and approved the final version submitted and take public responsibility for all aspects of the work.

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