

Worker health impacts from working from home during the COVID-19 pandemic

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Abstract.

BACKGROUND: COVID-19 was first reported in December 2019 in Wuhan, China. With the rapid spread of the virus, the World Health Organization (WHO) in March 2020 declared the initial outbreak of the disease a pandemic.

OBJECTIVE: To assess the challenges and consequences of working from home on worker health during the COVID-19 pandemic.

METHOD: Cross-sectional and descriptive study developed in Curitiba, Paraná, Brazil, from December 2020 to January 2021. An online questionnaire was used to interview workers working from home and later a statistical analysis was performed.

RESULTS: 327 workers from various fields of activity participated, mainly those from the south of the country, women, and workers who develop activities in education. In addition, results show anxiety and/or irritability, weight gain, discouragement, headaches and muscle and joint problems.

CONCLUSION: Most participants found an increase in working hours while working from home, with several breaks during the day and adequate furniture. However, there was a worsening of physical pain and changes in symptoms of anxiety, weight gain, discouragement and headaches.

Keywords: Ergonomics, musculoskeletal diseases, remote work, COVID-19

1. Introduction

COVID-19 was first reported in December 2019 in Wuhan, China, through cases of severe pneumonia with unknown causes. From the rapid spread throughout the world of the new virus strain found in patients, an outbreak of the disease was generated, leading the World Health Organization (WHO), on March 11, 2020, to declare this outbreak as a pandemic. In Brazil, the first confirmed case was in São Paulo on February 26, 2020 [1, 2].

Brazil and the world adopted measures to maintain social distance in an attempt to contain the transmission of the virus, culminating in the closing of places where there was a concentration of people, such as events, concerts, workplaces, commerce, among others. Many were forced to remain in their homes and adapt their work in order to perform them remotely. Thus, the impact of the pandemic in the work context was immense, both in the economic and psychological sphere [3, 4].

In view of the aforementioned changes it is important to emphasize that there are two terms to define work carried out outside the company, namely teleworking and working from home. Teleworking which is regulated in Brazil by Law number 13.467/17 is

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defined as the provision of a job performed outside the company's premises, using information and communication technology, but which does not represent external work. Working from home, on the other hand, is defined as work carried out directly from the employee's home, and follows several rules that are characteristic of teleworking [5, 6].

The working from home practice was adopted on a large scale as a more flexible alternative to work, using technology in favor of the worker, for the continuity of work in the midst of a pandemic situation. A practice that dates back to the oil crisis in the 1970s, when the goal was to relieve traffic and that now re-emerges as a strategy [7, 8].

This type of work required workers to acquire new skills, abilities and knowledge during this period, which resulted in a series of problems in adapting to new technologies and the remote work environment [9]. As for the companies, it was necessary to establish internal policies and standards for the development of these activities, such as a review of information security and investment in equipment and tools for remote communication [10].

In view of these new working conditions, one of the first problems encountered was the adequacy of space at home to carry out tasks, which involves everything from adequate furniture to good quality internet [11]. Another problem is related to the inspection of the space in order to ensure that the place meets the ergonomic guidelines, according to the rules of Safety and Occupational Medicine, preventing the development of chronic diseases, such as repetitive strain injuries/musculoskeletal disorders related to the work [12]. Therefore, since it is a private place and, therefore, difficult to inspect, it is up to the employer to inform their employees about the necessary care to avoid work accidents or occupational diseases [9].

Another problem that arose, due to this abrupt change in the work routine, was the overlapping of domestic tasks with work activities, where the worker's family life had to be reconciled with the profession, which creates a burden on well-being and mental health of these professionals. In addition, with this new mode of work, in which the worker no longer has a workplace disconnected from his home and a pre-defined time to carry out his work activities, he sees himself performing a kind of cloud activity, in which his performance is measured through achieved goals, often obliging himself to carry out continuous work, without adjusting schedules. Researchers still argue that even after this pandemic period this new work configuration will probably extend after

the discovery of vaccines and the cure of the disease [9, 10].

Despite the flexibility offered by this modality working from a distance brings consequences for the worker with some positive aspects, such as reduced personal costs, reduced time in traffic and flexibility with schedules, which can increase engagement at work [13]. As for the challenges, some points were addressed, such as: great commitment between the worker and their family so that the home does not interfere with their work or the opposite, as well as a great understanding on the part of family members to recognize this new modality [14]. In view of the present context, the aim of this study was to assess the challenges and consequences of working from home on workers' health during the COVID-19 pandemic.

2. Methodology

The present study is cross-sectional and descriptive with quantitative data analysis and was conducted from December 2020 to January 2021, in Curitiba, Paraná, Brazil. After conducting the invitations via e-mail and social networks, workers that carried out activities *working from home* as a result of the Covid-19 pandemic and who agreed to the Free and Informed Consent (FIC) were included in the survey.

The sample was a convenience one as it was conditioned to the largest number of participants who agreed with the study and who replied to the online questionnaire during the two months of data collection.

Respecting ethical principles an online form was developed by the researchers via the Google Forms platform in which the FIC was presented on the first page followed by questions related to 4 main themes. In addition, it is worth noting that the questionnaire was previously tested among researchers in order to analyze the need for spelling corrections, level of understanding of the questions and alternative answers, as well as to assess the average time taken to answer.

First, there were questions about sociodemographic data, such as gender, age and education, marital status, among others, so that the profile of the participants of the research could be outlined. The second topic addressed deals with health and well-being, containing questions about physical exercise, sleep quality and the level of anxiety after and during the pandemic. The next topic addressed is in relation to the worker's perception on working from home

quality and his or her role in the company in which he or she works. Finally, the last theme involves possible pains that the participant may suffer as a result of his or her work. To this end, the Nordic questionnaire was used, which is widely used in research involving the musculoskeletal system, as it standardizes the way in which pain is investigated and facilitates the measurement of results [15, 16]. The theoretical reasoning was based on current literature on the COVID-19 pandemic and its physical and mental repercussions on worker health in a working from home system.

For the statistical analysis, a descriptive analysis of the data was performed with absolute frequency, percentage. Spearman's correlation test was used, which consists of a test to assess the existing association between variables and to measure the correlation. For all analyses the R software version 3.6.3 was used.

3. Results

3.1. Participant profile

The study included 328 workers who replied to the virtual questionnaire. Of these, 327 responses were counted, and 1 was excluded for not having filled out the form completely. The sociodemographic profile of the studied population was outlined and detailed in Table 1.

The participants were predominantly female, which represented 70.1% of respondents; 29.9% were male. From the analysis of the data generated it was observed that there is a significant difference between the genders that participated in the research. It is noteworthy that due to this factor the correlations performed by the software were influenced. Regarding age, the largest percentage of participants (27.7%) were aged between 35 and 44 years. The marital status of the participants was mainly married or in a stable relationship (57.1%). And in relation to education, respondents were predominantly postgraduates (57.5%). The main branch of activity found was Education (32.4%). Regarding housing, it was identified that among the participants, 289 (88.3%) reside in the Southern region of the country, 25 (7.6%) in the Southeast region, 5 (1.5%) in both the Northeast and Center-West regions and 3 (0.9%) live abroad.

3.2. Working from home challenges

One of the challenges observed from the responses of the participants was in relation to the number of

Table 1
Sociodemographic profile of study participants

Variable	Category	n (%)
Sex	Female	229 (70)
	Male	98 (29,9)
Age	18–24 years	62 (18,9)
	25–34 years	80 (24,39)
	35–44 years	91 (27,74)
	45–54 years	57 (17,37)
	55–59 years	26 (7,92)
	+60 years	12 (3,65)
Marital status	Single	116 (35,4)
	Married/Stable union	187 (57,1)
	Divorced	22 (6,7)
	Widowed	2 (0,6)
Scholarity	Complete primary education	3 (0,9)
	Incomplete high school	1 (0,3)
	Complete high school	10 (3)
	Incomplete graduate education	58 (17,7)
	Complete graduate education	67 (20,5)
	Post-graduation	188 (57,5)
Occupancy time	1 month to 4 years	164 (50,1)
	5 – 9 years	66 (20,1)
	10 – 15 years	52 (15,9)
	+16 years	45 (13,7)
	Activity branch	Education
	Tecnology	54 (16,5)
	Administration	55 (16,8)
	Judiciary	43 (13,1)
	Marketing	19 (5,8)
	Health	19 (5,8)
	Public service	18 (5,5)
	Others	22 (6,6)

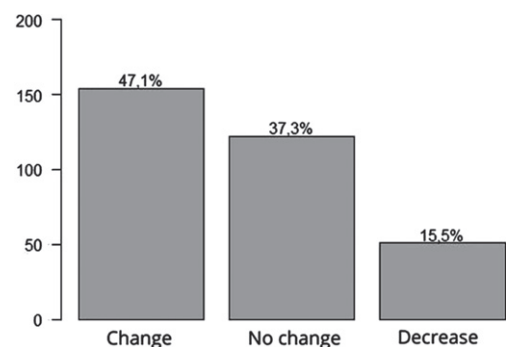


Fig. 1. Chart comparing working hours before and after working from home implementation.

hours worked before and after the pandemic: 154 participants (47.1%) said they are working more than in the face-to-face system and 51 (15.5%) declared that their daily workload decreased in the new way of working. In addition, it was also evidenced that for 122 people (37.3%) there was no change in the total hours worked (Fig. 1).

As for breaks, most participants (96%) of the survey said they took them, but in different ways, and most said they took breaks in an unscheduled way, due (in part) to the flexibility of hours guaranteed by working from home.

Furthermore, the opinion of the participants regarding the desk/chair set where they spend most of their time working from home was also verified. The majority (47%) believe that the furniture is good and meets their needs. However, the next data reveals that 23.8% believe that their furniture conditions are bad, which can directly influence productivity.

3.3. Working from home consequences

Some of the consequences observed in the responses of the survey's participants directly influence health and well-being. One of the results observed was the direct influence on the workers' sleep quality, in which 57.6% reported having changes in their usual sleep routine and 31.7% did not present changes.

In addition to sleep quality, other consequences investigated were related to symptoms or health problems arising from working from home. The most frequent answers were: anxiety and/or irritability (55.8%), weight gain (47.6%), discouragement (43.3%) and headaches (31.7%). To complete this category, the opinion of the participants regarding their level of anxiety during the pandemic was verified: 1 being not anxious and 5 very anxious. And the most recurrent answers (Fig. 2) were "3" (36.3%) and "4" (28.4%).

With regard to pain reported by research participants, 49.1% declared pain worsening and a visual scheme could be developed using the Nordic Questionnaire illustration (Fig. 3).

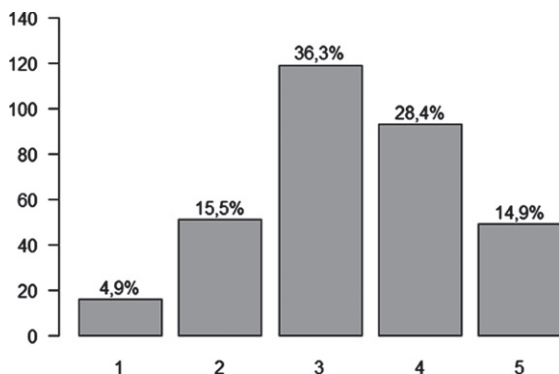


Fig. 2. Participants' anxiety level on a scale from 1 to 5.

Analyzing the answers it is possible to see that the body region most affected by pain is the lumbar region with 82.2%; and of these, 27.8% affirm that their pain falls within level 3, that is, the highest level of pain in the questionnaire.

Other parts of the body that were also highlighted in the item of pain are the neck (75.2%), shoulders (68.5%) and wrists and hands (61.4%), and more than 200 people indicated they suffered pain in all these same regions. Elbows, thighs, ankles and feet represent the least affected regions, with less than 30% incidence.

From the statistical analysis performed it was possible to correlate some of the results obtained in the research, which are shown in Table 2. Among these, there was a negative correlation between gender and the pain and complaints of the participants, such as shoulder -0.20 (p -value < 0.001) and headaches -0.24 (p -value < 0.001). For age, it was obtained that wrist/hand pain (p -value 0.02) and anxiety were significant (p -value < 0.001). As for working time, no significant variable. For the field of activity, it resulted that headaches (p -value 0.01) were significant.

4. Discussion

In order to assess the challenges and consequences of working from home on workers' health during the COVID-19 pandemic, participated in this research a majority of adult, young, married, post-graduated women with a relatively small occupation time working in the fields of education, technology, administration, judiciary, marketing, health or public service, among others. However, it is worth remembering that although women are the main subjects of the study, women are not the main object of this analysis.

A study on architects and engineers working from home conditions and health in which 65 individuals participated had a female majority, totaling 56.9% of the sample. Another study, whose goal was to assess the level of exhaustion of 85 professionals in the remote modality, also had a female prevalence (69.4%), as in the present research [16, 17].

Regarding the age range of the participants, in a survey on musculoskeletal and psychological disorders caused by remote work it was shown that the studied population had an average age of 31, which is similar to the sample in this study. In addition, still referring to the same authors, in agreement to

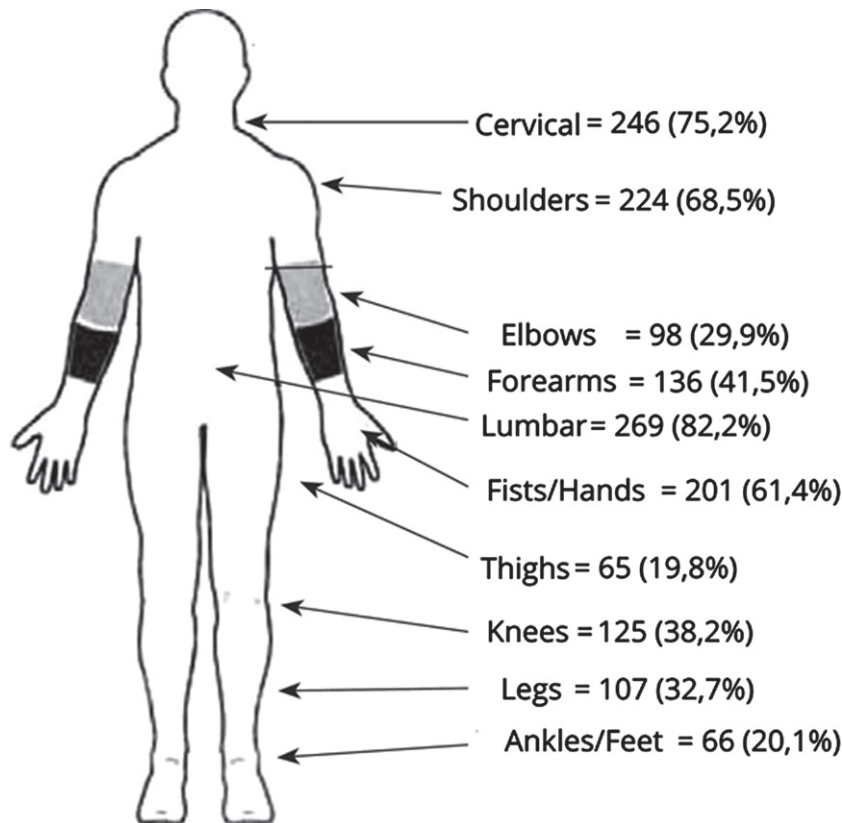


Fig. 3. Nordic Questionnaire.

Table 2
Correlations and respective *p*-values of Spearman Test recorded for pain and complaints, based on sex, age and working hours

Pain or complaint	Sex (<i>p</i> -value)	Age (<i>p</i> -value)	Time of work (<i>p</i> -value)	Activity branch (<i>p</i> -value)
Neck	-0.13 (0.016)	0.05 (0.314)	0.08 (0.116)	0.01 (0.792)
Shoulder	-0.20 (0.001*)	-0.01 (0.824)	-0.05 (0.365)	-0.02 (0.657)
Handle/hand	-0.21 (0.001*)	-0.12 (0.022)	-0.06 (0.230)	-0.01 (0.809)
Lumbar	-0.14 (0.010)	0.03 (0.555)	0.05 (0.341)	0.01 (0.791)
Anxiety	-0.24 (0.001*)	-0.14 (0.001*)	0.05 (0.69)	-0.01 (0.748)
Headaches	-0.24 (0.001*)	-0.1 (0.052)	0.01 (0.772)	-0.13 (0.015)
Weight gain	0.01 (0.895)	0.08 (0.180)	0.05 (0.376)	0.04 (0.450)
Discouragement	-0.06 (0.215)	-0.01 (0.937)	-0.01 (0.723)	-0.02 (0.680)
Pains worsened	-0.13 (0.014)	-0.06 (0.760)	0.11 (0.339)	0.02 (0.616)

**p*-value < 0.001.

the information found, it was also verified that most people are married [18].

It is possible to observe that they are qualified workers since most of them have a postgraduate degree. Thus, it is supposed they perform intellectual work, which requires an adequate environment in which to focus and have attention. Scholars show that the profile of remote workers includes high qualifications, large amounts of work, need for concentration, some degree of autonomy and use of technology [19].

In addition, it must be considered that, although some studies have found as a result that for both sexes social isolation had negative effects on contentment with work and family life, for women, it is even more complex, as they usually work double or triple shifts, as highlighted in another study on remote work, which showed that women who work remotely have a great demand for activities, as they carry out their professional activity and also have domestic responsibilities [20, 21]. That's why the

organization of time, space flexibility, number of children and number of computers influence on working from home.

With regard to the field of activity after the pandemic education professionals suffered a great impact, since remote learning requires the use of new technologies and platforms. In this context, a study reported that the main challenges faced by teachers were those related to teacher training, seeking to ensure quality in education and access to education. In addition, the management of their emotional issues, as well as those of their students, the reconciliation of work and family and the need to reinvent themselves in the profession, as they have not had prior qualification or preparation for virtual classes, which entails in problems for their physical and emotional health [22].

From the pandemic situation, supposedly, the worker should have physical space, furniture and proper equipment for remote work, in order to ensure social isolation and, at the same time, productivity. However, working at home has transformed the environment that was once one of relaxation and comfort into an office, causing a confusion in the worker's mind when it comes to separating his personal life from his professional life, a fact that can be an important influencer on that person's emotional well-being [23].

In the southern region of Brazil, which has the largest number of participants in this survey, very few companies provided their employees with a subsidy in the acquisition of computers, internet, among other technological devices. So, with the new modality of working from home the costs generally fell on workers. This is because the South region of Brazil, together with the Southwest region, has one of the best economic levels in the entire country. Therefore, one has to imagine that in other regions of Brazil the precariousness of working conditions is even greater.

When the questionnaires were applied, the pandemic had already imposed working from home for about 9 to 10 months and could only be remotely or a hybrid system.

There was a predominance of participants who reported working longer hours on the working from home system. But there was no question about the complexity of the work, that is, whether it increased or decreased after the new form of production. Another important point to be highlighted is in relation to breaks during the work period, which must be taken to rest the worker with an average time of 10 to 15 minutes, both in the morning and in the afternoon, in

addition to a longer break at lunchtime [22]. In this matter, the results obtained are related to the findings, as most respondents take breaks during working hours.

When joining to working from home some adaptations are necessary for workers, and these can have consequences (positive or negative) on the employee's relationship with the company, as well as on his health [14]. In order to find a healthy balance, it is important that workers know how to manage their time since there is greater flexibility to perform requirements [24, 25]. A study carried out at Shell Brasil shows that it is essential that individuals know how to organize themselves, with responsibility, self-control and, above all, discipline, so that there is no excess or insufficiency at work [26]. In addition, the autonomy given to workers regarding the total hours worked does not demonstrate control over what is done at working from home, being necessary other ways to ensure productivity, even if adjustable [24]. Respondents to a survey reported that working hours remain the same and are dictated by the amount of work existent, what changes is only the environment in which they are performed [8].

In the present study, most participants considered their furniture good and meeting their needs (47%); however, 23.8% considered the furniture bad. Literature was found which stated that body posture after *Working from Home* suffered a significant deterioration among workers, and this study addressed that ergonomic conditions found in the workplace, such as adequate furniture and infrastructure in general, may not be found in their homes [26]. This, therefore, demonstrates the importance of the adequacy of working from home for those individuals who, in this research, reported dissatisfaction with this item; and as the ergonomics itself proposes, the work environment must be suitable for man, bringing comfort and safety to him.

As shown in the results, the symptom most reported by research participants was "anxiety", and there was a significant difference between genders (with a predominance of females) and anxiety, and between age groups (from 35 to 44 years old) and anxiety. Another study verified the prevalence of stress, anxiety and depression in the general population after the COVID-19 pandemic and mentioned that these aspects are greater in the age group between 21 and 40 years, as it is the population of the main workforce, which generates an increased concern for thinking about the future consequences and economic challenges caused by the pandemic [27].

This anxiety symptom may be related to the psychosocial stress caused by the pandemic, which will affect work stress. Psychosocial stress refers to the adaptation to changes in life (such as what happens at this pandemic moment), and stress at work refers to the worker's frustrations with tasks that are beyond their professional capacity, manifesting itself through negative reactions, anxiety at work and emotional exhaustion [28]. These symptoms can lead to lasting health problems and, thus, health measures that aim to address psychosocial stress factors resulting from social isolation, fear and vulnerability should be adopted [29].

The second most cited symptom was "weight gain", as there was a significant difference between genders and weight gain, between the range of activities and weight gain, and between time in front of the computer and weight gain, or that is, there was an association among females, education professionals, and more hours in front of the computer and weight gain. These data may be related to the increase in physical inactivity during the pandemic, that is in agreement with another study, which mentions that social isolation results in greater physical inactivity, leading to an increase in various conditions, such as weight gain [30].

The regions in which the participants identified the most pain (lumbar, neck, shoulders, wrists and hands) may be related to the style of work performed, mainly due to spending a lot of time sitting in front of the computer. This data is in agreement with the results obtained in the statistical analysis, where it was observed that there was a negative correlation between gender and pain, with greater significance for pain in the shoulder and wrist and hand, and there was a significant difference between the time in front of the computer and the worsening of pain. Another study, which evaluated changes in musculoskeletal pain among office workers, identified commonly reported pain in the upper and lower extremities, neck and lower back (lumbar). However, it was shown that reducing the time spent working in a sitting position, only in the lumbar region there was a reduction in pain [31].

Other researchers also obtained results that corroborate the findings of the present study, indicating that the regions most affected by pain in office workers were the Cervical Spine, Shoulders and Lumbar Spine. This high incidence of pain was related to the possibility of using the workstation inappropriately - despite the fact that most workstations are in good ergonomic condition - and the adoption of inappro-

priate movements and postures, which demonstrates the importance of guidance to workers, especially the practice of physical exercises, which even when simple and performed at home can bring good therapeutic responses and help in health prevention [32, 33].

The physical demands of work produce more palpable musculoskeletal symptoms, such as pain, discomfort and fatigue. However, the consequences of the psychic and cognitive demands of work are not as visible to the observer's eyes, manifesting themselves in a subjective way, being difficult to measure. Hence the importance of public policies, continuous monitoring by managers and the provision of training/qualifications in order to minimize the harmful effects of work, whether physical or mental, especially in view of the new work challenges resulting from the pandemic.

In this sense, professionals in leadership positions should know how to identify when work is becoming a burden to their subordinates. Always maintaining communication between all positions in a company, they must create creating psychological follow-up channels with the use of technologies and encouraging workers to have a period of the day for self-care, with physical activities, yoga, meditation, among others [23].

The study's contributions to the scientific community occur when it allows reflections on the new context of the world of work, which imposes a new rhythm, other forms of organization, adjustments in the content of the work, among others, which impact on physical and/or mental health of workers. Despite portraying the more specific reality of southern Brazil it allows broader perspectives at the national and/or international level since working from home has spread worldwide as a result of the pandemic situation. Therefore, studies that address this issue are extremely important to avoid precarious work resulting from new trends in the contemporary world.

Some limitations were identified in this study, such as the reduced number of articles on the subject and not having been asked in the questionnaire about the improvement or worsening of sleep quality. Another limitation found is related to the complexity of the work performed remotely, as the researchers did not investigate whether there were changes in this regard.

5. Conclusion

It was possible to assess the challenges and consequences of the working from home on worker

health during the COVID-19 pandemic. Participants are having longer working hours with the possibility of breaks and flexible hours, but it is not known whether the complexity of the work has increased or if it has remained the same in this new context.

Despite considering having adequate furniture, most respondents reported worsening of physical pain in places of prevalent pain in individuals who work in an office. In this case, with higher prevalence for low back pain, neck pain, shoulder pain, wrist pain and hand pain. It was found that the longer the time spent working in front of the computer, the greater the risk of musculoskeletal pain.

Another relevant data was related to symptoms of anxiety, weight gain, discouragement and headaches, which are directly linked to the individuals' emotional health. In this sense, it is necessary to be aware because mental health has manifestations that can be invisible to managers, but that affects the individual in their quality of life which can result in depression, panic syndrome, among others, with the possibility of damage to the quality of work and productivity.

As working from home is showing every single day that it is here to stay, it is necessary that changes and adjustments to this system be made, both in terms of organizational work and regulatory issues. The need for training/capacity for the use of new technologies and virtual platforms is highlighted. In addition, the need for monitoring workers by professionals from a multidisciplinary team in order to balance the workloads ensuring the health of workers is needed.

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Conflict of interest

None to report.

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