



Musculoskeletal disorders in university professors who telework due to COVID-19 pandemic

Trastornos musculoesqueléticos en docentes universitarios que realizan teletrabajo en el marco de la pandemia con COVID-19

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Abstract

Introduction: Teaching virtually can cause symptoms related to muscle pain due to bad postures when working with computers. **Objective:** To determine the presence of musculoskeletal disorders in university professors who telework during the COVID-19 pandemic. **Materials and methods:** Analytical cross-sectional study in professors from health programs at a northeastern Colombian university. The validated Spanish version of the Nordic Kuorinka questionnaire was used (Cronbach's alpha 0.8-0.9). Using non-probabilistic sampling and an instrument applied virtually, 68 professors were included in the study. The dependent variable was presence of musculoskeletal disorder, whereas the independent ones were the sociodemographic conditions related to telework. The Fisher or were used for qualitative variables. Comparison of means were carried out through Student's t test. $p < 0.05$ values were interpreted as statistical association. **Results:** 67.7% of participants reported musculoskeletal disorder in at least one anatomical site, being the neck the one mostly affected. Female gender and seniority in teaching practice showed an association with the disorder ($p < 0.05$). **Conclusion:** Working conditions triggered by teleworking during the pandemic are associated with the presence of musculoskeletal disorders in professors.

Keywords: Educational personnel; COVID-19; working conditions; occupational health; muscular diseases. (Source: DeCS, Bireme).

Resumen

Introducción: El ejercicio de la docencia en modalidad virtual puede desencadenar síntomas relacionados con dolor muscular debido a las malas posturas frente al computador. **Objetivo:** Determinar la presencia de trastornos musculoesqueléticos en docentes universitarios que realizan teletrabajo durante la pandemia por COVID-19. **Materiales y métodos:** Estudio analítico de corte transversal en docentes de programas de salud de una universidad del nororiente colombiano. Se usó el cuestionario Nórdico *Kuorinka*, validado y adaptado al español [alfa de Cronbach 0,8-0,9], a partir de muestreo no probabilístico se incluyeron 68 docentes mediante instrumento aplicado en formato virtual. La variable dependiente fue la presencia del trastorno musculoesquelético y variables independientes las sociodemográficas y relacionadas con teletrabajo. Se usó el Test de Fisher en variables cualitativas. La comparación de medias se hizo con prueba t de *Student*. Se interpretó como asociación estadística valores de $p < 0,05$. **Resultados:** El 67,6% manifestó trastorno musculoesquelético en al menos un sitio anatómico; el cuello fue el área más afectada. El sexo femenino y la antigüedad en el ejercicio de la docencia mostraron asociación con el trastorno ($p < 0,05$). **Conclusión:** Las condiciones laborales generadas por el teletrabajo durante la pandemia se asocian con la presencia de trastornos musculoesqueléticos en docentes.

Palabras clave: Personal docente; COVID-19; condiciones de trabajo; salud laboral; enfermedades musculares. (Fuente: DeCS, Bireme).

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Introduction

A worldwide emergency was declared at the beginning of 2020 because of the rapid dissemination of COVID-19 related atypical pneumonia⁽¹⁾. To contain the infection, diverse branches of the economy, industry, and education gave recommendations to their staff to stay at home and thus telework became the methodology to fulfill job commitments^(2,3). Half of the companies worldwide had 80% of their employees working remotely from home during the first stages of the pandemic⁽⁴⁾.

Within higher education institutions (HEI) the use of telework also impacted the development of academic activities since they were forced to abruptly change their on-site model, which was used to design their curriculums and instead they had to adopt teaching methods based on technology to offer on-line classes without sufficient time to plan them⁽⁵⁾. Although this modality has had some advantages in the learning process such as accessibility, interactivity, and convenience, it has been necessary to prepare teachers in the management of virtual environments while at the same time developing curriculum contents in this new digital format^(6,7).

The main challenge of this teaching modality for professors has been the telework dynamic⁽⁸⁾. In many occasions a workspace at home is not available and it is difficult to establish limits between work and home activities, which results in a burden for the worker which increases work stress and invades one's privacy⁽⁴⁾. Studies have reported a perception of fatigue, mental burden and musculoskeletal disorders in workers who do all their activities from home and have decreased their physical activity^(9,10).

The literature has reported that confinement due to COVID-19 pandemic has triggered an increase in reports of musculoskeletal pain related to age (between 35 and 49 years), a body mass index higher than 30, being seated long periods of time, and telework^(11,12). Even though before the pandemic it was reported that musculoskeletal disorders represent the main and costliest occupational health problem in school teachers, a study carried out at the beginning of the pandemic with Peruvian university professors found that the prevalence of musculoskeletal disorders was 100%, reporting dorsal lumbar pain as the most frequent and finding an association of these disorders with ergonomic risk

factors such as prolonged posture and long working hours⁽¹²⁾.

The presence of musculoskeletal disorders can negatively impact the quality of life and work performance of professors. Therefore, it is proposed to determine the presence of musculoskeletal disorders in university professors who have been teleworking during the COVID-19 pandemic.

Materials and methods

Study Type

This was an analytical cross-sectional study⁽¹⁴⁾.

Sample and sampling method

The population corresponds to university professors from the Health field. The sample consisted of professors from the Health Sciences Division of the Santo Tomas University in Bucaramanga, Colombia. The inclusion criteria were being current employees of the undergraduate program of the Health Sciences Division and have been teleworking during the COVID-19 pandemic (since March 2020). Professors with chronic musculoskeletal pain diagnosed before March 2020 and those who declined to participate in the study were excluded.

The sample size was calculated based on the data reported in a similar study carried out by Garcia and Sanchez⁽¹²⁾ with professors from a Peruvian University. Thus, with a population of 16 professors, a prevalence of 67.3% of musculoskeletal disorders localized in the thoracic-lumbar spine, a 95% confidence level, and a 5% precision, a sample of 96 professors was estimated (data calculated using the Epidat 4.1 program). A sequential non-probabilistic sampling method was applied.

Study variables

The following socio-demographic variables were taken into account: age, gender, marital status, socio-economic stratum, home type, number of people living at home, number of children, and the highest education level. The work related variables were: academic program, type of employment contract, seniority, type of device used to telework, type of chair and table used during teleworking, and hours of computer use per day. Finally, those related to the variable of interest in the study were presence of musculoskeletal symptoms and body area where these disorders are present.

Instrument

The Spanish version of the Nordic Kuorinka questionnaire was used to screen for musculoskeletal disorders(15), which has been validated for the Latin American population with a Cronbach's alpha of 0.8 to 0.9.

Procedure

Professors were contacted to request their participation in the study through institutional email because data collection was done during the third peak of the pandemic, when they were in the academic alternation model (2021). WhatsApp texts were used as an alternative to enroll participants. Those who accepted were directed to a link in the Google Forms tool, where they could access the questionnaire.

Once the instrument was filled out, the information was consolidated in the cloud and later downloaded into a Microsoft Excel file, from where it was exported to the STATA 14.0 statistical package for the respective analysis.

Analysis plan

The univariate analysis shows qualitative variables as absolute frequency, relative frequency, and 95% confidence interval. In contrast, continuous quantitative data is presented as average and standard deviation, representing summary and dispersion measurements, respectively (normality was assessed through the Shapiro Wilk test). For the bivariate analysis, the output variable was the presence (yes or no) of musculoskeletal disorder; socio-demographic variables and those related to teleworking were the independent variables. In order to identify statistical association, Fisher's exact or Chi2 tests were used for qualitative variables. A p value lower than 0.05 was interpreted as statistical association between the musculoskeletal disorder and the independent variables.

Ethical considerations

This study has taken into account national guidelines regarding carrying out research in human beings and was approved by the institutional ethics committee under code 0150-2021. In accordance with resolution 8430 of 1993, this study has been classified as risk-free research, taking into account that the participants did not receive any intervention and all the information came directly from a self-filled questionnaire, without discussing sensitive data. However, if participants felt uncomfortable with the

questions, they were told they could leave the study at any time. To guarantee the anonymity of the information obtained from the research subjects, they were identified with a unique consecutive code, which was registered in the study database.

Results

A total of 68 participants were included in the study, which represents 70% of the total number of professors from the Health Sciences Division of the Santo Tomas University.

The majority of subjects of the sample were women (64.7%), married (52.9%) and belonged to socioeconomic stratum four (57.4%). Likewise, most professors were from the Dentistry Department (60.3%) and had master's level education and specialization training, with 36.8% each. A 67.7% (n=46) of participants stated that they had experienced a musculoskeletal disorder in at least one anatomical site since they began teleworking because of the confinement and isolation mandate issued since March 2020 due to the COVID-19 pandemic. Among the participants who reported musculoskeletal disorders, the most affected anatomical area was neck (67.7%), followed by lumbar back (61.9%) and thoracic back (44.1%). Gender and teaching seniority showed an association with the presence of musculoskeletal disorder ($p<0.05$) (Tables 1 and 2).

With respect to the effect of the musculoskeletal disorders on job performance, it was found that although neck discomfort was the most frequently reported by the participants, dorsal back pain (60%) as well as hand (66.7%) and wrist (60%) pain were the disorders that caused professors to change telework places (Table 2).

Participants were asked whether the presence of the disorder had prevented them from performing their duties, to which 28.3% responded affirmatively, being reported that one to seven days was the most frequent time missed from work (84.6%). In addition, they were asked about the need to receive treatment for musculoskeletal disorder management, to which 32 out of 46 subjects reported that they had received physical therapy (69.6%), whereas 23 received pharmacological treatment.

Lumbar back and neck were the anatomical sites for which some type of pain treatment was most frequently requested (Table 3).

Table 1. Participants with musculoskeletal disorder who had to change telework location due to muscle pain

<i>Anatomical site</i>	Had to change telework location due to MSD	
	Has MSD n(%)	n(%)
Neck	46(67.6)	22(47.8)
Shoulder	22(32.4)	10(45.5)
Dorsal back	30(44.1)	18(60.0)
Lumbar back	42(61.8)	24(57.1)
Arm	21(30.9)	9(42.9)
Elbow	13(19.1)	5(38.5)
Forearm	19(27.9)	6(31.6)
Wrist	15(22.1)	9(60.0)
Hand	12(17.6)	8(66.7)

*MSD: Musculoskeletal disorder

Table 2. Characteristics of university professors who performed telework and presence of musculoskeletal disorders

Variable	Total n(%)	Musculoskeletal disorders		p value
		No n(%)	Yes n(%)	
Gender				
Female	44(64.7)	10(22.7)	34(77.3)	0.022 [§] œ
Male	24(35.3)	12(50.0)	12(50.0)	
Age	45.0*(9.5)**	47.7*(9.4)**	43.7*(9.4)	0.111 [†]
Marital status				
Single	20(29.4)	5(25.0)	15(75.0)	0.610 [‡]
Married	36(52.9)	14(38.9)	22(61.1)	
Common law	10(14.7)	3(30.0)	7(70.0)	
Widowed	2(2.9)	0(0.0)	2(100)	
Socio-economic stratum				
Low (2-3)	10(14.7)	5(26.3)	14(73.7)	0.820 [‡]
Medium(4)	39(57.4)	14(35.9)	25(64.1)	
High (5-6)	19(27.9)	3(30.0)	7(70.0)	
Housing type				
House	21(30.9)	6(28.6)	15(71.4)	0.656 [§]
Apartment	47(69.1)	16(34.0)	31(66.0)	
Number of people at home	3.3*(1.1)**	3,1(1.2)	3,4(3.1)	0.305 [†]
Number of children	1.2*(1.0)**	1.2(1.0)	1.2(1.0)	0.773 [†]
Academic program				
Dentistry	41(60.3)	12(29.3)	29(70.7)	0.910 [‡]
Physical culture	13(19.1)	5(38.5)	8(61.5)	
Optometry	3(4.4)	1(33.3)	2(66.7)	
Oral rehabilitation	11(16.2)	4(36.4)	7(63.6)	
Education level				
Doctorate	8(11.8)	4(50.0)	4(50.0)	0.290 [‡]
Master's	25(36.8)	9(36.0)	16(64.0)	
Specialization	25(36.8)	5(20.0)	20(80.0)	
Undergraduate	3(4.4)	2(66.7)	1(33.3)	
Technologist	7(10.3)	2(28.6)	5(71.4)	
Type of contract				
Full time	48(70.6)	14(29.2)	34(70.8)	
Half time	17(25.0)	5(29.4)	12(70.6)	0.062 [‡]
Adjunct	3(4.4)	3(100)	0(0.0)	
Teaching seniority				
Less than 1 year	6(8.8)	1(16.7)	5(83.3)	0.005 [‡] œ
1 to 5 years	9(13.2)	4(44.4)	5(55.6)	
6 to 10 years	18(26.5)	1(5.6)	17(94.4)	
11 to 15 years	12(17.7)	3(25.0)	9(75.0)	

16 years or more	23(33.8)	13(56.5)	10(43.5)	
Type of telework device				
Desktop computer	11(16.2)	6(54.6)	5(45.4)	0.314‡
Laptop	53(77.9)	15(28.3)	38(71.7)	
Mobile phone	3(4.4)	1(33.3)	2(66.7)	
Other	1(1.5)	0(0.0)	1(100)	
Table for teleworking complies with ergonomic guidelines				
Fully complies	36(52.9)	8(22.2)	28(77.8)	0.086‡
Meets some	5(7.4)	1(20.0)	4(80.0)	
Does not comply	27(39.7)	13(48.2)	14(51.9)	
Chair for teleworking complies with ergonomic guidelines				
Fully complies	10(14.7)	5(50.0)	5(50.0)	0.436‡
Meets the majority	12(17.7)	4(33.3)	8(66.7)	
Meets some	30(44.1)	10(33.3)	20(66.7)	
Does not comply	16(23.5)	3(18.8)	13(81.2)	
Daily hours of device use				
4	25(36.7)	11(44.0)	14(56.0)	0.152‡
5-8	30(44.1)	7(23.3)	23(76.7)	
9-12	12(17.7)	3(25.0)	9(75.0)	
13 or more	1(1.5)	1(100)	0(0.0)	

§Chi2 test ‡Fisher's exact test †Student's t test *Average

**Standard deviation œp values with statistical significance

Table 3. Health conditions derived from the presence of musculoskeletal disorder

Condition	n(%)	95%CI
The disorder has prevented you from doing your job		
1 to 7 days	11(84.6)	54.6-98.1
1 to 4 weeks	1(7.7)	0.2-36.0
More than a month	1(7.7)	0.2-36.0
Type of treatment received for disorder management		
Pharmacological	23(50)	34.9-65.1
Physical therapy	32(69.6)	54.2-82.3
Surgical intervention	3(6.5)	1.4-17.9
Other	2(4.3)	0.5-14.8

Discussion

The implementation of teleworking was a strategy to facilitate learning processes in university students in the context of the COVID-19 pandemic⁽¹⁶⁾, taking advantage of the Information and Telecommunications Technology⁽¹⁷⁾. Nevertheless, the transition from face-to-face to virtual education has implied an adaptation of professors⁽¹⁷⁾, who have experienced the appearance of musculoskeletal symptoms derived from bad postures in front of the computer.

This work reports a perception of musculoskeletal disorders in 67% of the analyzed sample, which included professors from the Health field who

teleworked during the COVID-19 pandemic, with the neck being the most frequently compromised anatomical site. It was also evidenced that female gender and teaching seniority were associated with the presence of such disorders.

These results are consistent with those reported by Garcia and Sanchez⁽¹²⁾. They used the Kuorinka Nordic questionnaire to find a 100% prevalence of musculoskeletal disorders in university professors from Lima, Peru, who teleworked during the first semester of 2020. The authors found lumbar back disorder in 67% of professors, which is similar to the percentage observed in this study (61.8%). While Garcia and Sanchez observed 64.6% of participants

with neck disorder, we reported a 100% of professors with pain in this anatomical site. This difference could be due to the fact that the measurements of this work have been carried out more for than a year and a half in the continuous exercise of teleworking.

Kayabinar *et al.*⁽¹⁹⁾ published the results of a study with 40 primary and secondary school teachers in Turkey carried out during May and July 2020, using the Cornell and Profitmap-Neck Questionnaires, among others. Clinical assessment before and after online teaching due to the COVID-19 pandemic showed a significant increase in head, neck, and back discomfort⁽¹²⁾, which agrees with the findings of this study. However, our bivariate analysis found no association between the presence of musculoskeletal disorder and the daily hours of teleworking using mobile devices.

Similarly, a study of public school teachers from Brazil found the appearance of back pain in 57.8% of the participants as a consequence of the change in routine activities due to the COVID-19 pandemic⁽²⁰⁾. The regression analysis presented by the authors shows the association between back pain and female gender as well as with the teaching seniority (16 years or more), which is similar to what was observed in this work.

As highlighted by Cruz and Herrera⁽²¹⁾, the practice of teleworking is a factor that accelerates the appearance of musculoskeletal disorders due to the lack of a proper environment to carry out work related activities at home because of the absence of either physical space or infrastructure as well as the lack of knowledge regarding ergonomic standards required to work at home. This situation has been evidenced in university professors who have been teleworking since the beginning of the COVID-19 pandemic.

A strength of this study is that it reflects the situation of musculoskeletal disorders in university professors of a medium size city in Colombia through the use of a questionnaire that is validated in the context of the COVID-19 pandemic. However, since this a cross-sectional study, it lacks causal evidence, as the temporality criterion cannot be justified. Likewise, some participants stated that the questionnaire focuses on disorders of the torso and upper extremities, while not recognizing lower limbs disorders. Also, the sample size and sampling strategy limit the extrapolation of these findings to other

population groups as well as to professors from other disciplines. Finally, as self-report bias could be present, it is recommended to make more objective clinical assessments to have a more precise measurement of the events.

Conclusion

A high prevalence of musculoskeletal disorders is evidenced in professors from health disciplines working at a private university located in the northeastern region of Colombia, in which the neck is reported as the anatomical site most frequently compromised. Being a woman and having teaching seniority (6-10 years and >16 years) showed an association with the presence of the disorder.

Conflict of interests

The authors declare that they have no conflict of interests.

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