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ORİJİNAL ARAŞTIRMA ORIGINAL RESEARCH

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Investigation of Low Back Pain in the White-collar Population Working from Home Due to the COVID-19 Pandemic

COVID-19 Salgını Nedeniyle Evden Çalışan Beyaz Yakalı Popülasyonda Bel Ağrısının Araştırılması

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ABSTRACT Objective: Due to the coronavirus disease-2019 (COVID-19) pandemic, there have been major changes in the way almost every business works. This study examines the relationship between the changing working conditions [working from home (WFH)] related to COVID-19 on low back pain (LBP) and the associated kinesiophobia, disability, physical activity, and job satisfaction. M**aterial and Methods:** One-hundred-one white-collar workers who were WFH were included in the study, and demographic characteristics, presence of LBP, and other musculoskeletal disorders were questioned. Numerical Rating Scale for low-back pain and other musculoskeletal pain, Oswestry Disability Index (ODI) for determination of disability level, Tampa Scale of Kinesiophobia (TSK) for the presence of kinesiophobia, International Physical Activity Questionnaire (IPAQ)for physical activity level, and Utrecht Work Engagement Scale-6 (UWES-6) questionnaire for job satisfaction were applied via an online survey. **Results:** Of the participants 56.4% had LBP. The most common musculoskeletal disease following LBP was neck pain and/or dorsalgia (39.6%). The ODI (p<0.001), TSK (p <0.001) and the presence of kinesiophobia (p=0.016) were higher in participants with LBP. LBP was positively correlated with the ODI and TSK (r=0.489; p=<0.001, r=0.409; p=<0.001), and the other musculoskeletal pain has a positive correlation with the ODI (r=0.228; p=0.023). No relationship was found between UWES-6 and IPAQ with LBP. **Conclusion:** During the COVID-19 pandemic, white-collar workers WFH with LBP experience higher kinesiophobia and disability. Disability is increasing with LBP level and other musculoskeletal disease pain level. There was no relationship between the presence of LBP with job satisfaction and physical activity level.

Keywords: COVID-19; disability; musculoskeletal pain; low-back pain; working from home

ÖZET Amaç: Koronavirüs hastalığı-2019 [coronavirus disease-2019 (COVID-19] salgını nedeniyle neredeyse her işletmenin çalışma biçiminde büyük değişiklikler oldu. Bu çalışma, COVID-19'a bağlı değişen çalışma koşulları (evden çalışma) ile bel ağrısı üzerindeki kinezyofobi, disabilite, fiziksel aktivite ve iş tatmini ilişkisini incelemektedir. **Gereç ve Yöntemler:** Çalışmaya, evden çalışan 101 beyaz yakalı katılımcı dâhil edildi ve demografik özellikleri, bel ağrısı varlığı ve diğer kas-iskelet bozuklukları sorgulandı. Bel ağrısı ve diğer kas-iskelet sistemi ağrıları için Sayısal Derecelendirme Ölçeği (SDÖ), disabilite düzeyinin belirlenmesi için Oswestry Disabilite İndeksi (ODİ), kinezyofobi varlığı için Tampa Kinezyofobi Ölçeği (TKÖ), fiziksel aktivite düzeyi için Uluslararası Fiziksel Aktivite Anketi (UFAA) ve iş tatmini için İşe Tutulma Ölçeği-6 (UWES-6) çevrim içi bir anket aracılığıyla uygulanmıştır. **Bulgular:** Katılımcıların %56,4'ünde bel ağrısı vardı. Bel ağrısı sonrası en sık görülen kas-iskelet sistemi hastalığı boyun ağrısı ve/veya sırt ağrısıydı (%39,6). ODİ (p<0,001), TKÖ (p<0,001) ve kinezyofobi varlığı (p=0,016) bel ağrısı olanlarda daha yüksekti. Bel ağrısına bağlı SDÖ, ODİ ve TKÖ ile pozitif korelasyon gösteriyordu (r=0,489; p=<0,001, r=0,409; p=<0,001) ve diğer kas-iskelet sistemi ağrısına bağlı SDÖ, ODİ ile pozitif korelasyona sahipti (r=0,228; p=0,023). UWES-6 ve UFAA ile bel ağrısı arasında bir ilişki bulunamadı. **Sonuç:** COVID-19 pandemisine bağlı evden çalışan bel ağrılı beyaz yakalı çalışanlar daha yüksek kinezyofobi ve engellilik yaşamaktadır. Disabilite, bel ağrısı düzeyi ve diğer kas-iskelet sistemi hastalıklarına bağlı ağrı düzeyi ile artmaktadır. Bel ağrısı varlığı ile iş tatmini ve fiziksel aktivite düzeyi arasında ilişki bulunamamıştır.

Anahtar Kelimeler: COVID-19; disabilite; kas-iskelet ağrısı; bel ağrısı; evden çalışma

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The coronavirus disease-2019 (COVID-19) outbreak that started in China in December 2019 has become a worldwide threat and has been declared as a pandemic by the World Health Organization (WHO) as of March 11, 2020.[1] Disease-related consequences are very evident in many different areas, from health (physical and psychological) to socio-political and economic concerns.[1] According to the WHO, there were 59,204,902 confirmed cases and 1,397,139 deaths worldwide at the end of November 2020.[2] The fact that treatment and or vaccine with proven efficacy for COVID-19 has not yet been used has shown that the most important precaution that can be taken for the disease can be preventing transmission by social isolation. For this reason, the working lives of many people have changed profoundly. Working from home (WFH) is a working style that was created in the early 2000s when communication technologies began to develop and to ensure that employees avoid commuting, provide flexibility in schedules and achieve a better work-life balance.[3] To reduce physical contact between individuals and prevent new infections, many companies have driven their white-collar workers to WFH from collective offices with the possible use of technological tools.[4]

The advantages of WFH include reduced commute time, productivity gains, increased work motivation, better work-life balance, and better control over the schedule, while disadvantages include difficulty in keeping track of performance, cost of working from home, communication problems due to distance, and the lack of clear distinction between home and work duties.[4] The home environment can be flawed in many ways compared to the workplace. In particular, the absence of ergonomic office furniture at home can hinder a healthy posture and trigger musculoskeletal disorders (MSDs). In addition, working in a sedentary position for a long time increases the risk of neck and back pain.[5-7] WFH can also cause stress and work-life balance that affect work efficiency, well-being, and isolation.[8]

In addition to having to WFH, there has been an increase in musculoskeletal pain as a result of lockdown due to COVID-19, and even an increase in pain intensity in people with chronic pain syndrome.[9-11] It has been suggested that the most common reasons for this are sedentary behavior, physical inactivity, and comorbid psychological disorders.[10]

Serious changes occurred in work organizations with the restrictions applied during the COVID-19 pandemic and social isolation process. With the decrease in consumption due to the increase in WFH population in companies, the continuity of production thought that white-collar workers can continue to work from home for the next term. In this context, it is intended to draw attention to the MSDs that WFH white-collar workers may encounter, especially to examine the low-back pain (LBP) that occurs with poor posture. This study aims to investigate the prevalence of LBP in a white-collar worker population who went to work (outside their home; an office, bank, etc.) before the pandemic period but had to work at home due to the pandemic; to examine the relationship between job satisfaction, kinesiophobia and physical activity.

MATERIAL AND METHODS

STUDY PARTICIPANTS

The white-collar workers who previously worked in the office but had to WFH during the COVID-19 pandemic were included in this cross-sectional study. Participants who WFH before the pandemic and started to work part-time in the office later in the period were excluded. Participants who have been WFH for at least 6 months are included.

Participants meeting the study criteria were shared a computer-built questionnaire (www.surveymonkey.com) and asked to mark the answer that was appropriate for them. On the questionnaire, demographic data such as age, height, weight, gender, educational status, and marital status were questioned without sharing the names of the patients, and then the presence of low back pain, its severity (numeric rating scale), and the presence of other MSDs were investigated. Whether there is a doctor's application for LBP and the treatments applied were also investigated. After sociodemographic and clinical questioning, various questionnaires were applied to evaluate the current conditions of the individuals. The survey was published online on December 04, 2020, participants were contacted to the survey via e-mail,

a full description of the study was given, and it was completed on December 14, 2020.

Written informed consent was obtained from the participants. The study protocol was approved by Health Sciences University Ethics Committee (2020/434, 04.12.2020) and the Ministry of Health of the Republic of Turkey. The study was conducted in accordance with the principles of the Declaration of Helsinki.

MEASUREMENTS

The numeric rating scale (NRS) is used to measure and follow the pain intensity. The patient scores between 0 and 10 for pain. 0 means painlessness and 10 means the most severe pain.[12] The Oswestry Disability Index (ODI) questions how much LBP affects daily living activities and evaluates disease-specific disability. It consists of 10 questions and the patient gets a minimum of 1 and a maximum of 6 points for each question. Accordingly, the percentage of the patient's life activities is calculated.[12] Yakut et al. performed the validity and reliability of the Turkish version.[13]

To evaluate the job satisfaction of the patients, the Utrecht Work Engagement Scale (UWES-6) was used. The version of the 17-item Utrecht Retention Scale, which was first developed by Schaufeli et al., was shortened and reduced to 6 items. In this study, the abbreviated 6-item version was used.[14,15] UWES-6 is a questionnaire consisting of 6 items with 7-point Likert type scoring. Participants score each item between 0-6 and the total score is calculated as a percentage. Guler et al. established the validity and reliability of the Turkish version of the UWES-6.[15]

The Tampa Scale of Kinesiophobia (TSK) is a Likert scale consisting of 17 items and each item is scored between 0 and 4. Turkish validity and reliability were performed. The person is scored between 17 and 68, and higher scores indicate higher fear of movement.[16]

The International Physical Activity Questionnaire Short form (IPAQ) consists of 7 questions, provides information about walking, time spent in moderate to vigorous activities, and sitting time. Higher results indicate that the participant is more physically active.[17]

After sharing an explanatory information mail to the eligible participants and the link of the questionnaire created on surveymonkey.com, the responses of the participants were recorded on the system. After the survey application is terminated, the results were taken from the current website and uploaded to the SPSS data system for statistical analysis.

To calculate the sample size, the mean data of the "Utrecht Work Engagement Scale" evaluated in WFH participants with and without musculoskeletal pain in a similar study were used.[4] Accordingly, 48 patients are needed for 80% power. When the probable drop rate was calculated as 20% and added, it was planned to include at least 56 participants in the study.

STATISTICAL ANALYSES

Descriptive statistical analysis was performed using the SPSS v. 25.0 software (SPSS Inc.; Chicago, IL, USA). The descriptive statistical methods (frequency, percentage, mean, standard deviation) were used to evaluate the demographic data. The Shapiro-Wilk normality test was performed for the data. The data did not show a normal distribution and the Mann-Whitney test was used for comparison between the two groups. Chi-square test was used for comparison of qualitative data. The Spearman correlation analysis was used for analyzing the association of two different quantitative data. The results were evaluated at a confidence interval of 95% and a significance level of $p<0.05$.

RESULTS

Among the 119 participants who completed the questionnaire electronically, 2 of them were WFH before the pandemic, and 16 were not included because they worked part-time in the office. A total of 101 white-collar workers WFH were included in the study. The average age of the participants was 33.95±5.99 and the percentage of women was 58.4%. Average working hours per week was 47.1±9.15 and 68.3% of them were at the university level. General characteristics of the population are summarized in Table 1.

As seen in Table 2, 56.4% of the participants had LBP during the survey period. 71.3% of them had back pain during the period of WFH during the

TABLE 1: General characteristics of the participants.

		Overall (n=101)	
		Minimum-Maximum	Mean±SD
Age (years)		24-57	33.95±5.99
Weight (kg)		41-122	69.23±16.22
Height (cm)		151-195	169.56±9.48
Weekly working time hours		30-112	47.1±9.15
		n	%
Gender (n,%)	Female	59	58.4
	Male	42	41.6
Education level (n,%)	High school	2	2
	University	69	68.3
	University master/Doctor of philosophy	30	29.7
Marital status (n,%)	Married	54	53.5
	Single	47	46.5
Smoking (n,%)	No	76	75.2
	Yes	25	24.8
Alcohol use (n,%)	No	23	22.8
	<3 times/month	54	53.5
	1-2 times/week	19	18.8
	≥3 times/week	5	5

N:Number of participants; SD: Standard deviation.

TABLE 2: Evaluation of all participants in terms of musculoskeletal diseases and applied questionnaires.

		Overall (n=101)	
Low back pain (n, %)		57	56.4
Low back NRS (min-max, mean±SD)		0-9	2.74±2.8
Low back pain in times of COVID-19 (n, %)		72	71.3
Treatment (n, %)	None	76	75.2
	Paracetamol	1	1
	NSAIDs	4	4
	Exercises	11	10.9
	Resting	3	3
	Physical therapy	1	1
	Ergonomic furniture change	4	4
	Hot pack	1	1
Consult a doctor (n, %)		4	4
Other MSDs (n, %)	None	46	45.5
	Neck pain/dorsalgia	40	39.6
	Leg pain	5	5
	Widespread pain	3	3
	Shoulder pain	3	3
	Arm pain	1	1
	Chest pain	2	2
	Coccydynia	1	1
Other MSDs NRS (min-max, mean±SD)		0-10	3.07±3.27
UWES-6 (min-max, mean±SD)		17-100	70.45±17.07
ODI (min-max, mean±SD)		0-40	8.78±8.24
TSK (min-max, mean±SD)		21-52	36.38±5.85
IPAQ (min-max, mean±SD)		0-6,410	755.92±1089.02
Sitting time (min-max, mean±SD)		25-1,000	499.33±226.77

SD: Standard deviation; N: Number of participants; NRS: Numeric Rating Scale; NSAID: Non-steroidal anti-inflammatory drug; MSD: Musculoskeletal disease; UWES: Utrecht Work Engagement Scale; ODI: Oswestry Disability Index; TSK: Tampa Scale of Kinesiophobia; IPAQ: International Physical Activity Questionnaire.

COVID-19. While the most common treatment for LBP was home exercises, only 4 of the population consulted a doctor for this reason. The most common MSD other than LBP was neck pain and/or dorsalgia (39.6%).

The NRS average of the participants with LBP was 4.86±1.87 and 96% of them had back pain at another time during the pandemic period. When examined in two groups as participants with and without LBP, the ODI ($p<0.001$), the TSK ($p<0.001$), and the presence of kinesiophobia ($p=0.016$) were statistically significant between both groups. No significant difference was observed between groups in UWES-6, IPAQ, and sitting time ($p>0.05$) (Table 3).

When the correlations of NRS scores related to LBP and other MSDs with the evaluation question-

TABLE 3: Intergroup comparison of physical and demographic characteristics, and questionnaires.

		Low back pain		
		Present n=57	Not present n=44	p value
Age (years)		34.14±7.02	33.03±4.45	0.837
Weight (kg)		68.23±15.87	70.53±16.47	0.329
Height (cm)		169.06±9.95	170.69±9.88	0.661
Gender (F/M)		32/25	27/17	0.597
Education level (High school/University/Master, Doctor of Philosophy)			2/36/19	0/33/11
0.268				
Marital status (M/S)		31/26	21/23	0.833
Smoking		15	10	0.679
Alcohol use	No	14	9	0.953
	<3 times/month	30	24	
	1-2 times week	10	9	
	≥3 times/week	3	2	
Weekly working time (hours)		47.91±7.09	46.56±5.79	0.983
Low back NRS (mean±SD)		4.86±1.87	0	<0.001
Low back pain in times of COVID-19 (n, %)		55 (96%)	17 (39%)	<0.001
Treatment	None	38	38	0.178
	Paracetamol	1	0	
	NSAIDs	3	1	
	Exercises	10	1	
	Resting	2	1	
	Physical therapy	1	0	
	Ergonomic furniture change	2	2	
	Hot pack	0	1	
Consult a doctor (n)		4	0	0.200
Other MSDs (n)	None	24	22	0.232
	Neck pain/ dorsalgia	19	21	
	Leg pain	4	1	
	Widespread pain	3	0	
	Shoulder pain	13	0	
	Arm pain	1	0	
	Chest pain	2	0	
	Coccydynia	1	0	
Other MSDs NRS (mean±SD)		3.63±3.56	3±2.83	0.133
UWES-6 (mean±SD)		69.86±19.86	69.16±15.6	0.745
ODI (mean±SD)		12.8±9.98	5.63±6.61	<0.001
TSK (mean±SD)		38.14±5.79	34.88±5.69	0.001
Kinesiophobia presence		34 (60%)	16 (36%)	0.016
IPAQ (mean±SD)		843.63±1230.48	871.59±1168.93	0.927
Sitting time (mean±SD)		470.29±204.97	535.47±249.27	0.257

N: Number of participants; SD: Standard deviation; NRS: Numeric Rating Scale; NSAID: Non-steroidal anti-inflammatory drug; MSD: Musculoskeletal disease; UWES: Utrecht Work Engagement Scale; ODI: Oswestry Disability Index; TSK: Tampa Scale of Kinesiophobia; IPAQ: International Physical Activity Questionnaire.

TABLE 4: Correlation of low back pain and other MSD pain with questionnaires.

	Low back pain NRS	Other MSDs NRS
ODI (r, p)		
	0.489**	0.228*
	<0.001	0.023
UWES-6 (r, p)	0.036	-0.185
	0.726	0.066
TSK (r, p)		
	0.409**	0.118
	<0.001	0.242
IPAQ (r, p)	-0.017	0.074
	0.869	0.478
Sitting time (r, p)	-0.104	0.037
	0.399	0.767

MSD: Musculoskeletal disease; NRS: Numeric Rating Scale;
ODI: Oswestry Disability Index; UWES: Utrecht Work Engagement Scale;
TSK: Tampa Scale of Kinesiophobia; IPAQ: International Physical Activity Questionnaire.
* Correlation is significant at the 0.05 level
** Correlation is significant at the 0.01 level

naires were examined, it was found that LBP was positively correlated with the ODI and the TSK (r=0.489; p=<0.001, r=0.409; p=<0.001, respectively), and the other MSDs pain level was found to have a positive correlation with the ODI (r=0.228; p=0.023). No significant relation was found between the UWES-6, the IPAQ, and sitting time with NRS scores (p>0.05) (Table 4).

DISCUSSION

It was aimed to examine the relationship between LBP and other MSDs pain with disability, kinesiophobia, job satisfaction, and physical activity level in white-collar workers who had transitioned to WFH due to the COVID-19 outbreak. Results showed higher rates of kinesiophobia and disability in WFH workers with low back pain. In addition, there is a relationship between the intensity of LBP and disability and kinesiophobia score, and between the intensity of other MSD's pain and disability. There was no relationship between job satisfaction and physical activity levels with the presence of low back pain.

In previous studies, 34% to 51% of office workers reported experiencing low-back pain, while the prevalence of neck pain ranges from 42-69% within 12 months.[18] In our study, the frequency of LBP was found to be slightly higher (56.4%) and neck pain was slightly lower (39.6%) in WFH office workers. Regarding the physical health problems associated with WFH, prolonged sitting duration in a poor posture, increased physical inactivity due to the use of non-ergonomic equipment, and accompanying psychological comorbidities due to COVID-19 outbreak may be promoting the onset of MSDs, particularly LBP. The presence of pain due to MSDs does not differ significantly from the prevalence of pain in office workers in the literature, and this may be since non-ergonomic working equipment has not been used for years. In a study examining WFH office workers during the COVID-19 pandemic, a decrease in general physical and mental well-being and an increase in new physical and mental health problems were found. Reduced physical activity, increased intake of junk food, lack of communication with colleagues, and having a toddler at home were cited as the reason for this condition.[3] According to a national survey, similar to our study, comparing the population going to work and WFH during the 3-month lockdown period of the COVID-19 outbreak, complaints due to LBP in the population staying at home were found to be more, and complaints of neck, upper back, shoulder, and hip/thigh pain were less than those who went to work.[10]

There are conflicting results in the literature, and this is probably related to the multi-factor structure of low-back pain. Although it has been suggested in studies that the risk of LBP increases in office workers when they sit for more than 7-hours a day, however, no significant relationship has been shown between sitting itself and the risk of LBP.[19] Similarly, in our study, no relationship was found between physical activity and sitting time with the presence of LBP. Both groups were minimally active according to the IPAQ. The reason why physical activity level and sitting time were not different between the groups may be that the duration of pain in patients has not been investigated. In the case of chronic pain in patients, sitting time and physical activity levels could be affected. Also, the 3-month lockdown process may significantly reduce the activities of the individuals, resulting in a decrease in physical activity in the entire population regardless of musculoskeletal pain.

In this study, job satisfaction was similar in groups with and without LBP. One reason for this may be that chronicity has not been investigated for low back pain. Patients may not experience any change in job satisfaction during the period when they experience acute LBP. Another reason is that people WFH were not included in the study before the pandemic. The patients 'mean duration of WFH was 9-months, and the LBP emerging during this period may be unlikely to affect the patients' job satisfaction. In another study conducted during the COVID-19 pandemic period, lower job satisfaction scores were found in workers with pain compared to painless workers.[4] It was shown that, as the use of telecommunications increased, job satisfaction initially increased; however, it has been shown to plateau slightly at higher levels of homework. In the aforementioned study, weekly working hours were lower, and UWES job satisfaction scores were also lower in the painful and painless group than in our participants.[4] There may not be a significant difference reflected in the scores, as the job satisfaction of our working population is on a plateau due to the long working hours and workload.

The kinesiophobia and disability levels that increase with LBP were found similar to the studies in the literature.[20] The most likely reasons for this are the self-protection mechanism of the locomotor system in case of low back pain or the fear of movement that occurs because it does not want to trigger the pain. In a state of fear and avoidance of movement, the individual does not perform the movement and becomes physically inactive, resulting in a vicious circle leading to a physical disability similar to the result we found. In previous studies, it has been shown that the presence of kinesiophobia and higher scores in the TSK are associated with the severity of pain in patients with pain and are important in determining the individual's disability.[20,21]

An ergonomic and comfortable workplace and a proper exercise program can help prevent MSDs.[4,22,23] It is recommended that the height of the desk and chair be adjustable so that the feet are always supported on the floor so that they are placed correctly on the floor. In cases where a height-adjustable chair is not available, it is recommended to use a footrest. Also, the monitor should be at appropriate eye level to avoid tilting the head.[4] In addition, in the presence of low back pain, the myofascial release and stretching of the key muscles as well as strengthening the muscles around the low-back can play an active role. The increased muscle strength will support the back and provide flexibility to help relieve pain caused by poor postural positions during WFH.[22,23]

LIMITATIONS AND STRENGTHS OF THE STUDY

The study has several limitations. Firstly, pain levels before the COVID-19 outbreak were not questioned while investigating patients' low-back and other MSD pain levels. Second, this cross-sectional study was carried out using information obtained using a questionnaire shared on the website. Therefore, there may be a possibility of selection bias.

In the future, it is planned to switch to a working style called "hybrid", which will significantly affect the lives of white-collar workers. In some periods, employees may be planned to carry out their work from home. Its main strength is that it is a study that explains MSDs encountered by people who WFH and allows planning the precautions that can be taken accordingly.

CONCLUSION

After the COVID-19 outbreak, white-collar workers WFH with LBP experience higher kinesiophobia and disability. Disability is increasing with LBP level and other MSD's pain level. There was no difference in job satisfaction, physical activity levels, and sitting times between white-collar workers with LBP and without LBP. Further studies with larger sample sizes are needed to examine the impact of WFH on the musculoskeletal system and health-related burden.

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Conflict of Interest

No conflicts of interest between the author and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

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