

A Research on Home Workers' Work-Related Musculoskeletal Disorders in Pandemic Period

Huseyin Yener*

Abstract: Working life has been transformed and its dynamics experienced a new break with the Covid-19 outbreak which made working home model as a new normal. Coronavirus caused significant changes in all aspects of life, which an important one was compelling people staying and working home. Hence, increasing sedentary lifestyle and spending more time on internet and television affected musculoskeletal health negatively. The aim of this study is to investigate the impact of working home arrangements on work related musculoskeletal disorders (WMSD) during Covid-19 pandemic. Research was conducted with a group of 424 participants who experienced working home style in pandemic period in Turkey. A questionnaire containing demographic questionnaire and Cornell Musculoskeletal Discomfort Questionnaire (CMDQ) was sent to participants. The findings of this study showed that the working home arrangements during pandemic period worsened the musculoskeletal health of the participants. It is predicted that this deterioration will continue to increase with the continuation of working from home. Consequently, in order to decrease this negative situation, organizations and individuals should take the necessary precautions, regulations and training.

Keywords: Covid-19, working home, work-related musculoskeletal disorders (WMSD), ergonomics, Cornell Musculoskeletal Discomfort Questionnaire (CMDQ)

INTRODUCTION

Covid-19 was declared as a “pandemic” meaning global epidemic (WHO, 2020). During the lockdown, individuals’ daily outdoor activities were limited (Pulla 2020). The findings of a recent study showed that pandemic period was significantly reduced physical activity (Srivastav, Sharma & Samuel 2021). Staying at home for a long time may cause some problems such as physical immobility,

* Huseyin Yener (✉)

Industrial Engineering Department of Maltepe University, Istanbul, Turkey
e-mail: huseyinyener@maltepe.edu.tr

gaining weight and social isolation which may put individuals' health in danger. Poor posture, repetitive movements, heavy lifting during working from home may cause or deteriorate to development of WMSD (Fallon, et al., 2020; Lesser & Nienhuis, 2020; Koohsari, et al., 2021; Stockwell, et al., 2021).

Globalization, developments in information technology, transformation to information society, the idea of developing a work environment suitable for workers' style and demographic changes have forced to change traditional working style through working home model (Lup 2021). In this way, the barriers of workplace are removed. Covid-19 pandemic made working home arrangements as common way of working.

There are several advantages of working home model as improving employee productivity, reducing operating costs and commute time, reducing traffic-related stress, especially for those living in big cities. It also saves on personnel transportation, travel and clothing expenses. Moreover, working home arrangements provide employees more power, freedom, control and flexibility in their work lives (Lupton & Haynes 2000).

Despite the positive effects of working home arrangements, there are also negative effects that can cause for the organizations, individuals and society. The negative aspects of working from home are psychological effects including isolation, loneliness and feeling worthless. Lack of mutual relationship with colleagues, gossip and rumors, workplace news, new development and professional and social isolation can increase inner tension by arousing a feeling of loneliness in employees. Working away from the workplace has negative effects on loss of status and career development (Kurland & Cooper 2001). Home working arrangements can also negatively affect the social structure in the workplace.; because those who stay in the workplace, compared to those who work independently of their place and time may believe that they are doing too much work (Kurland & Bailey 1999).

In this study it is aimed to investigate the effects of working home arrangements on body parts through a full year using CMDQ. Hypothesis of this study was determined as follows:

H 1: There is a statistically significant increase about the frequency and impact of WMSD complaints in any part of the body during Covid-19 pandemic?

LITERATURE REVIEW

Work Related Musculoskeletal Disorders and Covid-19

WMSD is defined as “health problems in systems that provide movement such as muscles, tendons, skeleton, cartilage, ligaments and nerves” (Luttmann, Jager, Gaffler, Liebers & Steinberg 2003). Musculoskeletal disorders are observed due to repetitive movements or awkward postures (Aarås, Horgen & Ro 2000; Gerr, Marcus & Monteilh 2004). More than half of adults reported musculoskeletal complaints. So it may be the most common in the society. Because of the impact of Covid-19, working from home arrangements may trigger WMSD.

The main problems caused by Covid-19 are: the pandemic has caused significant disruptions in all areas of life; the immobility may be one of the most important consequences of pandemic period and may trigger many health problems which may start or deteriorate WMSD (Harcombe, Herbison, McBride & Derrett 2014; Lippi, Henry & Sanchis-Gomar 2020). In the literature, it was found that musculoskeletal disorders cause pain and functional disability, and their burden on individuals and society has been increasing worldwide (Jin et al. 2020; Safiri et al. 2020; Lewis et al. 2019).

The gaining weight is one of the most important adverse impact of physical immobility (Pietiläinen et al. 2008). Therefore, special attention should be given to minimize the effects staying home during COVID-19 pandemic and effective measures should be developed at individual, corporate and government scale. It has been widely demonstrated that working non-ergonomic environments, awkward postures, repetitive movements and continuous working without giving rest break increases the risk of MSDs (Hoe, Urquhart, Kelsall & Sim 2012; Jensen, Finsen, Søggaard & Christensen 2002). The main mental problems caused by working from home are sleeping disorders, work-related stress and social isolation which facilitate WMSD (Armitage & Nellums 2020).

Working Home and Covid-19 Pandemic

In the Information Age, the office does not need to be a building. A rowing amount of work can be done anywhere if there is access to the internet. Working home is a job preference that gives employees the flexibility to work at home, removing traditional and centralized workplace, geographic and organizational barriers. It can be defined as

a business arrangement where employees work at home instead (Teo, Lim & Wai 1998).

There are many factors that determine the attitudes of individuals towards working from home. Work related drivers explain individuals' productivity, satisfaction, job autonomy, and relationship with their superiors and colleagues. On the other hand, the drivers for individual and quality of home life reflect gender, marital status, income, child ownership, distance from home-workplace, ability to use information technology, etc. It is determined that gender and marital status are effective on working from home decision. In the literature women and married employees prefer to work from home more than male and single employees (Belanger 1999); because female employees desire to balance work and home responsibilities or career and the obligation to fulfill family responsibilities together.

In work home arrangements employees find themselves to control their jobs as it provides invisibility and flexible planning from colleagues, more authority in their own business life and ability to evaluate mistakes, freedom, control and flexible time (Mokhtarian & Bagley 2000).

Working from home can increase job satisfaction as well; because it gives the flexibility to set and manage business hours. In the literature, it is found that work from home arrangements reduced 20% of the employee's turnover rate and increased the probability of staying in the workplace (Lim & Teo 2000).

METHOD

Participants

424 participants filled up the online questionnaire experiencing working home style during pandemic period. The demographic, work related, working conditions profile of participants were as follows:

- 249 (58.7%) female and 175 (41.3%) male
- 196 (46.2%) 20-34 age group, 87 (20.5%) 35-44 age group and 141 (33.3%) over 45 age group
- 389 (91.7%) university degree and 35 (8.3%) Ms., or PhD. Degree
- 390 (92%) working in closed environment and 34 (8%) working in open environment
- 254 (59.9%) working in sitting position, 9 (2.1%) working in standing and 161 (38%) working in both sitting and standing position

- 292 (68.9%) working as office working style, 27 (6.4%) working by using muscle force and 105 (24.8%) working mixed style
- 261 (61.65) declared no gaining weight, 98 (23.1%) gained up to 2 kg., 51 (12%) gained up to 3 to 5 kg and 14 (3.3%) gained more than 5 kg

Measures

CMDQ is one of the most commonly used scales to determine WMSD. In the study, "Personal Information Form" and "CMDQ" were used as the data collection tools. Personal Information Form includes questions about participants' demographic, work related, working conditions. CMDQ, a 54-item questionnaire with a body chart and questions about discomfort occurrence in 20 parts of the body, was developed by Professor Alan Hedge. In the first part, the frequency of pain in the body regions is asked. Similarly, in the second and third parts, the discomfort level experienced and its effects on participants' daily activities.

Validity coefficients of the questionnaire were found between 0.62–0.92 and correlation coefficients were found between 0.46–0.83 across body parts. Overall, the questionnaire's Cronbach's alpha test results for frequency, severity and interference scales were found as 0.876, 0.895 and 0.875 respectively indicating a high level of internal consistency (Erdoğan, Hot & Ozkaya 2009).

CMDQ calculation was done by multiplying the values of frequency, level, and the impact of the discomfort. At first, the participants were asked to rate the frequency of discomfort of body regions considering pre-Covid-19 period and post-Covid-19 period. Then, participants rated the pain level of discomfort. Body parts were determined as dependent variables and participants' demographic and working condition data were determined as independent variables.

RESULTS

In the study, the Cronbach's alpha test showed that the applied survey had a sufficient internal consistency and reliability. Cronbach alpha value of CMDQ was found as 0.71. The reliability coefficient of 0.70 and above indicates that the measurement tool used is reliable and has internal consistency between items (Nunnally & Bernstein 1994).

In the study, test statistics were used to compare the data whether there is significant difference in complaints before (working in office environment) and during lockdown period (working home). Paired

Sample t-Test statistics at a confidence level of $p < .05$ was conducted for the comparison of the total mean values. A descriptive analysis was conducted for the calculation of the average values and standard deviation. The data obtained showed a normal distribution according to the Kolmogorov–Smirnov test ($.200 > .05$). H_1 was not rejected with a Sig. (2-tailed) value ($.021 < .05$). This shows that there is significant difference in complaints before (working in office environment) and during lockdown period (working home). According to the results of t-test; sig (2-tailed) values were found as 0.004 for neck, 0.011 for shoulder, 0.005 for upper back, 0.031 for lower back and 0.019 for knee.

Evaluation scale whether a complaint about a body part falls into slightly, moderately or very uncomfortable category was calculated as follows: Frequency score (0, 1.5, 3.5, 5, 10): 1.5 low, 3.5 medium, 5 and 10 high. Discomfort score (1,2,3): 1 low, 2 medium and 3 high. Interference score (1,2,3): 1 low, 2 medium and 3 high. Slightly complaint: from $1.5 * 1 * 1 = 1.5$ to $1.5 * 3 * 3 = 13.5$. Moderately complaint: from $3.5 * 2 * 2 = 14$ to $3.5 * 3 * 3 = 31.5$. Very uncomfortable complaint: from 31.5 to $10 * 3 * 3 = 90$.

General Evaluation

Almost all of the participants 376 (88.7%) complaint about pain in one of their body parts during working home period. On the other hand, 48 participants (11.3%) declared no complaints at all. While majority 181 (42.7%) had moderately complaints, 99 (23%) of them declared slightly complaints and 96 (23%) of them had very uncomfortable complaints. The body regions complained of are mainly as follows: Neck, shoulder, upper back, lower back, hips and knee. Very few or no complaints have been reported on other body parts.

Risk factors are gender, age, gaining weight, poor posture, sitting for long periods of time (more than 6 hours) and working conditions (Dunlevy et al. 2019; Miranda, Viikari-Juntura, Martikainen & Riihimäki 2002; Murphy & Carr 2010; Rachmi, Werdhani & Murdana 2018; Vantulder, Koes & Bombardier 2002). Detailed results and interpretations about body parts are given below:

Neck: Neck pain is one of the major WMSD among adults (Vingård 2006). According to the results of the study neck is the most important complaining body part. Majority of the participants 337 (79.48%) felt pain at a level. More than half of the participants 245 (57.78%) stated that they had slightly complaints in working home period while 87 of

them (20.51%) reported no complaints. 51 (12.03%) of them had moderately complaints and the rest of them 41 (9.68%) had very uncomfortable complaints about neck.

It is investigated that whether there are significant differences among sub-groups of variables or not. The higher mean value means the higher level of discomfort with respect to the lower value. It is found that gender mean values indicate that females' complaint mean value (12.143) in neck is almost twice of male mean value (6.823) which shows females felt more neck discomfort than male during pandemic period. 35-44 age group got the highest mean value (19.701) in neck then 20-34 age group (9.166) and over 45 age group (5.014) respectively. It is remarkable that in spite of having the smallest member group (87 20.5%) with respect to the others, this age group complained more than the others. Gaining weight is one of the most remarkable consequences of staying home inactive during pandemic. It can be clearly seen that the more you get weight the more you feel pain in neck (Dunlevy et al. 2019). Gaining more than 3 kg has the highest mean value (19.500), 0-2 kg (10.107) and keeping the same weight (8.368) respectively. Static type of working (closed, sitting and office style) has higher mean values than dynamic type of working (open, standing and working with muscle force) which indicates more shoulder complaints with respect to other.

Shoulder: Shoulder complaints and neck complaints are related to each other. A significant amount of shoulder complaints may be due to problems with the neck (Murphy & Carr 2010).

Again the majority of the participants 346 (81.6%) felt pain at a level. A high ratio of the participants 305 (71.93%) stated that they had slightly complaints in working home period while 78 of them (18.39%) reported no complaints. 32 (7.54%) of them had moderately complaints and very few of them 9 (2.12%) had very uncomfortable shoulder complaints.

It is investigated that females' complaint mean value (4.916) in shoulder is four times of male mean value (1.629). 35-44 age group got the highest mean value. And gaining weight more than 3 kg got the highest mean value (12.304). Static type of working (closed, sitting and office style) has higher mean values than dynamic type of working (open, standing and working with muscle force) which indicates more shoulder complaints with respect to other.

Upper back: Discomforts in the upper back is also common as lower back or neck pain and can limit your movements and

capabilities. Lack of exercise, long periods of sitting, poor posture for a long time, excessive weight and aging can deteriorate the upper back discomforts (Dunlevy et al. 2019).

Majority of the participants 338 (79.71%) felt pain at a level similar to previous body parts revealed. Approximately half of the participants 211 (49.76%) stated that they had slightly complaints in working home period while 86 of them (20.3%) reported no complaints. 96 (22.64%) of them had moderately complaints and the rest of them 31 (7.31%) had very uncomfortable upper back complaints.

It is seen that females' complaint mean value (11.564) in upper back is almost three times of male mean value (4.546). Older age is again a deteriorating factor and 35-44 age group got the highest mean value (14.701). Gaining weight is another factor for upper back and gaining more than 3 kg got the highest mean value (22.647). Static type of working (closed, sitting and office style) has higher mean values than dynamic type of working (open, standing and working with muscle force).

Lower back: Lower back pain is a common discomfort affecting more than half of the adults at some time in their lives (Balagué, Mannion, Pellisé, & Cedraschi 2012; Vantulder et al. 2002).

It is recorded that the highest ratio of the participants 389 (91.74%) felt pain in their lower backs with respect to the other body parts. Majority of the participants 313 (73.82%) stated that they had slightly complaints in working home period while 35 of them (8.25%) reported no complaints. 96 (22.64%) of them had moderately complaints and the rest of them 31 (7.31%) had very uncomfortable lower back complaints.

For Lower back body dimension females' complaint mean value (7.418) is very close to the male mean value (4.546). In lower back, younger group (20-34 age group) got the highest mean (9.184) contradicting to the literature. Gaining weight is another factor for upper back and gaining 0-2 kg got the highest mean value (11.230). Static type of working (closed, sitting and office style) has higher mean values than dynamic type of working (open, standing and working with muscle force).

Knee: Sitting down in a non-ergonomic chair all day can be a very poor posture to maintain, especially on your joints like those in your knees. Knee body dimension is found as the second highest ratio of the participants 386 (91.03%) felt pain. Very few of the participants 55 (12.97%) stated that they had slightly complaints with respect to the

other body parts while 38 of them (8.96%) reported no complaints. Moderately complaints took the highest number with 331 (78.06%) and no very uncomfortable complaint was reported.

It is seen that males got higher mean value (5.297) than females (.570). Younger group (20-34 age group) got higher mean (4.314) than older groups contradicting to the literature. Gaining weight more than 3 kg got the highest mean value (2.676). Working position is one of the risk factors for knee, so mixed working position (sitting and standing together) and mixed working style (working office type and muscle force type) got higher mean values 5.693 and 8.086 respectively.

CONCLUSION

Results of this study are in line with the literature that frequency and pain increased during the lockdown periods (Fallon et al. 2020; Jin et al. 2020; Rachmi et al. 2018; Safiri et al. 2021). The resulting values concluded that the pandemic period affected the WMSD negatively. A significant increase was found in complaints during pandemic period with respect to before pandemic period. Neck results of this study that females have more complaints than male is in line with the other studies (Genebra, Maciel, Bento, Simeão & Vitta 2017; Hush, Michaleff, Maher & Refshaug 2009; Loyola University Health System, 2016; Vingård 2006). Shoulder disorders were found more common in women and old-aged people (Chard, Hazleman, Hazleman, King & Reiss 1991). Also gaining weight results were found deteriorating shoulder discomforts (Dunlevy et al. 2019). In this study, shoulder complaint findings were similar to the findings in the literature (Murphy & Carr 2010).

According to the results of this study the recommendations for organizations are given below in case of Covid-19 pandemic lockdown period continues or reason arises and compels working from home:

Organizations should

- Assess risks and implementing appropriate control measures
- Inform the employees about health and safety issues, provide guidance on what is a safe home office environment
- Give guidance on the importance of rest breaks
- Educate the employees about physical exercise, good posture
- Provide psychological support for employees
- Support the employees with equipment compatible with ergonomic standards to be used in working home environment

Employees should

- Cooperate with their employer and follow their instructions
- Follow the rules for work safety, follow instructions on how to use the equipment provided
- Report injuries to the employer immediately
- Dedicate a suitable place at home for working from home
- Stick to routine activities as much as possible
- Learn and apply exercise for every body part
- Give eye break, for 5 to 10 minutes in an hour
- Use ergonomic equipment

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