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THE RELATIONSHIP BETWEEN PHYSICAL ACTIVITY, DEPRESSION, NUTRITION AND PAIN DURING THE COVID-19 PANDEMIC PERIOD
COVID-19 PANDEMİSİ DÖNEMİNDE FİZİKSEL AKTİVİTE, DEPRESYON, BESLENME VE AĞRI ARASINDAKİ İLİŞKİ

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ABSTRACT

The Corona virus Disease 2019 (COVID-19) is an infectious disease that affects the respiratory tract. After the disease was recognized as a global pandemic by the World Health Organization (WHO), precautions such as social isolation and curfews were implemented to prevent the spread of the disease. These precautions have affected individuals' physical activity levels, anxiety levels, and eating habits. Reduced physical activity level, emotional changes, and bad eating habits are among the factors that may affect perceived pain. The purpose of our study is to determine the changing basic lifestyles during the Covid-19 disease period and to examine their relationship with the perceived pain level. The study was a quick and large cross-sectional online survey using the Google Forms web survey platform. 1174 volunteers between the ages of 18-65 participated in our study. The survey contained demographic information, International Physical Activity Questionnaire (IPAQ) to determine physical activity levels, Attitude Scale for Healthy Nutrition (ASHN) to evaluate nutritional attitudes, Hospital Anxiety-Depression Scale (HADS) for anxiety and depression levels, and The Nordic Musculoskeletal Questionnaire (NMQ) to determine perceived pain levels. A moderate correlation was found between insufficient physical activity and neck pain ($r=-0.262$, $p=0.040$), back pain ($r=-0.254$, $p=0.048$) and low back pain ($r=-0.275$, $p=0.034$). On the other hand, a weak correlation was found between depression levels and low back pain ($r=0.213$, $p=0.049$). A negative correlation was found between anxiety and depression levels and physical activity level ($r=-0.433$, $p=0.033$; $r=-0.549$, $p=0.004$) and healthy eating attitude ($r=-0.258$, $p=0.041$; $r=-0.317$, $p=0.039$). During the Covid-19 pandemic, it is necessary to increase the physical activity levels of the public and to make them aware of the short and long-term negative effects that may occur as a result of changes in basic lifestyles.

Keywords: Anxiety, COVID-19, exercise, musculoskeletal pain, nutritional status

ÖZ

Koronavirüs Hastalığı 2019 (Covid-19) solunum yollarını etkileyen bulaşıcı bir hastalıktır. Hastalık Dünya Sağlık Örgütü (WHO) tarafından dünya genelinde salgın olarak tanımlandıktan sonra hastalığın yayılımını önlemek için sosyal izolasyonlar ve sokağa çıkma yasakları gibi tedbirler uygulanmaya başlandı. Bu tedbirler insanların fiziksel aktivite ve anksiyete düzeylerini ve beslenme alışkanlıklarını etkilemiştir. Azalan fiziksel aktivite düzeyleri, duygusal değişiklikler ve kötü beslenme alışkanlıkları algılanan ağrı düzeylerini etkileyebilecek faktörler olabilir. Çalışmamızın amacı, Covid-19 hastalığı döneminde temel yaşam tarzlarındaki değişimleri belirlemek ve algılanan ağrı düzeyi ile olan ilişkisini incelemektir. Çalışma, Google Formlar web anketini kullanan, hızlı ve geniş kesitli çevrimiçi bir anket çalışmasıdır. Çalışmamıza 18-65 yaş arası 1174 gönüllü katıldı. Ankette demografik bilgiler, fiziksel aktivite seviyelerini belirlemek için Uluslararası Fiziksel Aktivite Anketi (IPAQ), beslenme tutumlarını değerlendirmek için Sağlıklı Beslenmeye İlişkin Tutum Ölçeği, anksiyete ve depresyon seviyeleri için Hastane Anksiyete-Depresyon Ölçeği (HADS) ve algılanan ağrı seviyelerini belirlemek için Nordic Kas-İskelet Anketi (NMQ) kullanılmıştır. Yetersiz fiziksel aktivite ile boyun ağrısı ($r=-0.262$, $p=0.040$), sırt ağrısı ($r=-0.254$, $p=0.048$) ve bel ağrısı ($r=-0.275$, $p=0.034$) arasında orta düzeyde bir korelasyon bulundu. Öte yandan depresyon düzeyleri ile bel ağrısı arasında zayıf bir korelasyon bulundu ($r=0.213$, $p=0.049$). Anksiyete ve depresyon düzeyleri ile fiziksel aktivite düzeyi ($r=-0.433$, $p=0.033$; $r=-0.549$, $p=0.004$) ve sağlıklı beslenme tutumu ($r=-0.258$, $p=0.041$; $r=-0.317$, $p=0.039$) arasında negative korelasyon bulundu. Covid-19 salgını sırasında halkın fiziksel aktivite düzeylerinin artırılması ve temel yaşam tarzlarındaki değişiklikler sonucu ortaya çıkabilecek kısa ve uzun vadeli olumsuz etkilerin farkında olmalarının sağlanması gerekmektedir.

Anahtar kelimeler: Anksiyete, COVID-19, egzersiz, kas-iskelet ağrısı, beslenme durumu

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INTRODUCTION

The Corona virus disease 2019 (COVID-19) caused by the Sars-Cov-2 virus appeared in Wuhan province of China in December 2019 and has become a pandemic, leading to severe upper respiratory symptoms in a short time (1). As of September 22, 2020, the number of cases has exceeded 30 million, and the number of deaths has been approximately 1 million. The measures taken to control the COVID-19 pandemic include several procedures, such as keeping people at home. Those measures also involve the suspension of formal education and transition to distance education, temporary closure of workplaces, home working, local quarantines, and curfew restrictions. Undoubtedly, regardless of being infected or not, the pandemic has affected all people's lifestyle habits, such as physical activity and nutrition habits (2).

Physical activity is a general term characterized by all kinds of body movements using energy. The WHO and several leading health organizations have recently underlined the necessity of physical activity in all age groups, suggesting a specific physical activity period for different age groups (3). Long-term physical inactivity and sedentary lifestyle increase the risk of cardiovascular diseases, diabetes, and obesity, and are associated with 6-10% of deaths from non-communicable diseases (4). Another symptom induced by physical inactivity is musculoskeletal problems (5). The pain caused by the musculoskeletal system adversely affects the life quality and can lead to a vicious circle due to the postponement of physical activities (6).

Technology companies such as Apple and Google have published essential data on the changes in human mobility (7). According to the "Google COVID-19 Community Mobility Report" released in May 2020, the number of people visiting leisure centers such as museums, shopping malls, cafes, and restaurants decreased 65% since last January. This decline was 38% for parks and 51% for workplaces. According to the report, the number of people spending time at home has increased to 22% (7). The measures have played a very crucial role in reducing the spread of the disease. However, it has led to several unfavorable outcomes such as decreased daily physical activities and a sedentary lifestyle (8). Many healthcare organizations have aimed to raise social awareness and reduce such side effects by preparing physical activity programs and brochures of exercise recommendations that people can do at home (3). The studies on the relationship between physical activity and musculoskeletal pain indicate that physical inactivity results in pain around the shoulder, neck, back, and waist among office workers, the people who have a sedentary lifestyle and sit for a long time during the day, and the students who do not do sports activities (9).

As in all viral diseases, it is essential to have a healthy immune system to defeat the COVID-19 virus. A healthy immune system is closely related to a balanced and regular diet (10). Some studies reported problems in the food production system and a growing food crisis during the pandemic (11). However, it is observed that consumers prefer cheap foods that can be stored for a long time (12). It has inevitably led to specific negative changes in eating habits. Besides, anxiety and depression that might stem from less social relationships, the

fear of getting infected and losing loved ones, have adversely affected the eating habits, which lead to a weak immune system, obesity, and chronic diseases, and comprise an obstacle in combating the virus (13).

Situations that cause fear and anxiety, such as pandemics, are likely to trigger depressive disorders (14). Studies have found that anxiety and depression cause various diseases by influencing many biological activities, especially the autonomic nervous system and hormonal system (15). It is also shown that anxiety and depression affect eating habits and pain perception (14).

Although the relationships between the immune system problems related to physical inactivity, anxiety level, and an unhealthy diet, and musculoskeletal pain has been clarified in different groups in the literature, the effects of mandatory restrictions in daily life during the COVID-19 pandemic on musculoskeletal pain are still unknown. In this sense, this study aimed to determine the effects of social isolation conditions during the COVID-19 pandemic on physical activity levels, nutritional behaviors, and anxiety levels and evaluate the relationship between the fundamental lifestyle changes and pain perception.

MATERIAL AND METHOD

Study Design and Ethics

The study was a quick and large cross-sectional online survey using the Google Forms web survey platform (Google LLC, Mountain View, CA, United States). It was approved by the Kırşehir Ahi Evran University Medical Faculty Clinical Research Ethics Committee (of 10/06/2020, and number 2020-08/55), and carried out by the Declaration of Helsinki and Human Rights. The surveys were shared via social media outlets such as Instagram, LinkedIn, Facebook, and WhatsApp, and via participants' emails. Before the survey, electronic informed consent was obtained from participants, and they were informed about the right to withdraw without justification.

Participants

The study universe consisted of literate women and men between the ages of 18-65 years and different social classes and educational backgrounds in Turkey. We used the voluntary response sampling, which is one of the non-probability sampling methods in our study. The study group included 1174 volunteer participants who agreed to fill out the online surveys. Individuals younger than 18 and older than 65 years old and those with orthopedic or neurological disorders that could affect the physical activity performance were not included in the study.

Data Collection

Respondents answered the online questionnaire anonymously between June 11, 2020, and July 11, 2020. They also completed five standard questionnaires, including Demographic Information (body weight, body height, age, and gender and education level), Physical Activity Level, Healthy Eating Attitudes, Anxiety-Depression, and Pain Scale. Data were collected using the Turkish versions of all questionnaires and permission has been obtained to use the questionnaires.

Demographic Information: The information about age, gender, body mass index was obtained from all the participants.

International Physical Activity Questionnaire (IPAQ) (Short): The physical activity performances were assessed using the International Physical Activity Questionnaire Short Form (IPAQ-SF). IPAQ-SF consists of seven questions. The Cronbach's alpha on items about physical activity in the short version was 0,60. It investigates the frequency of vigorous physical activity, moderate physical activity, and jogging activity weekly, daily, and minutely, and asks respondents to inform about how much time they sit daily. A respondent's physical activity level can be measured as minute/week (MET) and categorized as low-medium-high. Saglam et al. conducted a Turkish validity and reliability study of the tool (16).

Attitude Scale for Healthy Nutrition (ASHN): It is a five-point Likert-type scale including 21 items and four sub-dimensions: knowledge about diet, feelings about diet, healthy diet, and unhealthy diet. The validity and reliability study in Turkey was completed in 2019. The lowest score on the scale is 21, and the highest score is 105. Besides, 21 is considered "very low", 22-42 points "low", 43-63 points "medium", 64-84 points "high", and 85-105 points "pretty high" level of healthy eating (17).

studies in the Turkish language was carried out by Kahraman et al. in 2016 (19).

Statistical Analysis

The study data were analyzed using the "IBM SPSS (Statistical Package for the Social Sciences) for Windows, Version 22.0. Armonk, NY, USA: IBM Corp." package program. The Shapiro Wilk test was performed to determine whether the data had a normal distribution. Descriptive statistics such as mean ± standard deviation and percentage (%) were also applied for the analysis. Pearson Correlation Analysis was used to assess the relationships between the variables. r values were set at 0-0.25 for weak; 0.25-0.50 for moderate; 0.50-0.75 for significant, and 0.75 and above for strong correlation. The point of statistical significance was set at p <0.05.

RESULTS

Table I shows the descriptive statistics of the participants. According to this, a total of 1174 participants (female: 681, male: 493) with a mean age of 31.42±5.83 were included in the study, and their average body mass index was 27.68±8.44 kg/m².

The relationships between physical activity level,

Table I: Descriptive characteristics of the participants

Variable	Mean ± Sd	Percent (%)
Age	31.42±5.83	-
Gender (Female)	-	%58
Educational level		%1
Graduate of primary school		%2
Graduate of secondary school		%8
Graduate of high school		%84
Graduate of university		%5
Postgraduate		%5
Body mass index	27.68±8.44kg/m ²	-

Hospital Anxiety-Depression Scale (HADS): Sigmund et al. developed the tool in 1983, and Aydemir carried out its Turkish validity and reliability study in 1997. Although the purpose of the scale was to examine patients' anxiety and depression levels in the hospital environment, it can also be used with the general population and out of the hospital environment. It includes four-option 14 items and two sub-dimensions: anxiety and depression. There are seven items in each sub-dimension. The total scores range between 0 and 21 in sub-dimensions. A threshold value of 0-7 is set as "normal", 8-10 is as "borderline", and 11-21 is as "abnormal" (18).

The Nordic Musculoskeletal Questionnaire (NMQ): Musculoskeletal pain was measured using The Nordic Musculoskeletal Questionnaire. The tool investigates the frequency of the pain in the neck, shoulder, elbow, hand/wrist, back, waist, hip/thigh, knee, and foot/ankle in the last 12 months, one month, and a week the impacts on daily life. Additionally, it finds out the age of onset of pain, the effects on work/home life, the availability of health care support, and the use of pain killers due to pain. The adaptation, validity, and reliability

healthy eating attitudes, anxiety and depression levels, and the pain in the neck, back, and low back are summarized in Table II. According to the findings, there was a strong and positive correlation between physical activity level and healthy eating attitudes (p=0.005) and a moderate and negative correlation between anxiety and depression levels, physical activity, and healthy eating habits (p=0.033; p=0.041). The pain around neck, back and low back were moderately correlated with inadequate physical activity during COVID-19 pandemic (p=0.040; p=0.048; p=0.034). Besides, it was found that as low back pain intensified, a low level of depression appeared (p=0.049). Intra-rater and inter-rater analyses were done through the ICC coefficients, and thus quantifications were determined to be reliable (ICC>0.70).

DISCUSSION

The given online survey study was conducted during social isolation and curfews due to the COVID-19 pandemic, and 1174 people from different age groups participated in the online survey. The study findings indicated different correlations between the physical activ-

Table II: Correlations between the variables

	Physical Activity Level	ASHN	HADS Anxiety	HADS Depression	Neck Pain	Shoulder Pain	Back Pain	Low Back Pain	Femoral/ Hip Pain	Knee Pain
Physical Activity Level	r 1 p 1174									
ASHN	r .543* p .005 N 1174	1								
HADS Anxiety	r -.433* p .033 N 1174		1							
HADS Depression	r -.549* p .004 N 1174			1						
Neck Pain	r -.262* p .040 N 1174				1					
Shoulder Pain	r -.028 p .713 N 1174					1				
Back Pain	r -.254* p .048 N 1174						1			
Low Back Pain	r -.275* p .034 N 1174							1		
Femoral/Hip Pain	r -.194 p .055 N 1174								1	
Knee Pain	r -.142 p .062 N 1174									1

ASHN: Attitude Scale for Healthy Nutrition,
HADS: Hospital Anxiety and Depression Scale,
* Statistically significant at $p < 0.05$

ity levels, healthy eating attitudes, anxiety and depression levels, neck, back, and low back pain.

The most effective way to prevent an outbreak is to avoid infection and contact with the virus. As a result of the measures, many employees have started home working, students have begun distance education, and curfew restrictions have been imposed on certain days. Studies emphasized the acute effects of those practices on physical activity (8). In their multinational study on the changes in eating habits and physical activity levels during the Covid-19 pandemic, Ammar et al. reported a 38% decrease in general physical activity and an increase of 28.6% in the time spent sitting (a decrease of 36.9% in strenuous physical activity; 34.7% in moderate physical activity; 42.7% in walking activity) (2). A study conducted with university students in Turkey showed a sharp decline in regular and irregular physical activities was also underlined (20). Many health institutions, including WHO, have published physical activity guidelines and brochures to prevent the adverse effects of the decrease in physical activity level and physical inactivity, such as cardiovascular diseases and obesity (3).

Another negative outcome of physical inactivity is musculoskeletal pain. The current study revealed that physical inactivity is moderately correlated with neck pain, back pain, and low back pain. Several studies investigating the relationship between physical activity practices, levels, and pain found that physically active individuals can alleviate and even prevent the pain in the neck, shoulder, and low back (4, 5, 20). Teichtahl et al. (2015) also reported that low-level physical activity is associated with narrowed intervertebral disc space, fatty degeneration in the multifidus muscle, and pain (21).

However, there is no scientific data available on the positive effects of physical activity on the immune system and against COVID-19. However, epidemiological data proved that physically active individuals have fewer symptoms of upper respiratory tract diseases, and exercising can protect against many types of viral infections (22). Animal experiments and preclinical studies reported that moderate exercises could reduce morbidity and mortality rates against some respiratory viral diseases (8). Nevertheless, available information is limited since no large-scale studies are investigating the relationship between exercising and COVID-19. Apart from chronic diseases, lifestyle-related conditions such as obesity and physical inactivity, which are also independent risk factors, have led to a rise in mortality and morbidity rates in the COVID-19 pandemic (23). Therefore, it is recommended that people maintain exercise habits complying with the rules of hygiene and social distance during and after the pandemic, and the ministry of health and occupational organizations to publish guidelines and brochures.

The studies about the relationship between COVID-19 disease, anxiety, and depression reported that the anxiety and depression rates in the general population rose due to the pandemic and prolonged isolation (24). In research in the United Kingdom, it was also found that anxiety, depression, and stress disorder in the general population increased during the pandemic, and the most affected population included women, young people, those with children, those who have financial prob-

lems due to the pandemic and those with chronic diseases (14). A study that was carried out in Turkey during the outbreak also has reached similar results. According to the study findings, women, city residents, those with a psychiatric or chronic disease were among the risk factors for anxiety (25). Many studies in the literature highlight a relationship between depression, anxiety, and pain (15). Sheng et al. underlined the relationship between chronic pain and depression and found that both pain and depression were associated with similar regions of the brain and functional neurological systems that pain caused depression, and depression intensified the perceived pain (26). In the current study, it is also seen that there was a relationship between low back pain and depression.

The study data showed a negative and moderate relationship between anxiety and depression and physical activity, stemming from various factors. For example, exercise increases the endorphin level (8), influences the monoamine activity in the central nervous system (27), reduces hypothalamic-pituitary-adrenocortical activity (28), promotes physical fitness, enhances self-confidence (29), and have positive results such as distraction of negative thoughts, better sleeping quality, and adaptation to stress (30). Besides, the time spent outside the home to perform physical activity during the pandemic can be one of those outcomes. Previous studies have shown that physical activity prevented anxiety and depression and could be used for therapeutic purposes and against cognitive disorders, dementia, anxiety, and depression (30).

Problems related to the access to fresh food, consumer preferences for the products that can be stored for a long time during home isolation, and the food crisis in the food production chain due to the pandemic are among the factors that can change eating habits (11, 12). The data obtained in the current study found a negative and significant relationship between healthy eating attitudes and anxiety and depression. Garipoğlu et al. emphasized that foods with high carbohydrate and fat content were substantially consumed during social isolation (31). Ammar et al. stated that people's eating habits changed during the COVID-19 pandemic. These changes include high consumption of unhealthy and junk foods, uncontrolled eating, and may stem from anxiety or boredom (2). An unhealthy diet can lead to obesity, and diabetes of type 2 directly influences the immune system. It is known that the coronavirus disease may cause severe damages in these patients and even result in death (3). As a result of the study, it was observed that people with high anxiety and depression symptoms exhibited unhealthy eating attitudes. Hence, it can be implied that the frequency of chronic diseases and obesity would increase due to COVID-19 pandemic and unhealthy eating habits.

Another important finding of the study was the strong correlation between healthy eating habits and physical activity levels. It is expected that people who have healthy diets also do physical activity regularly or vice versa. Ball et al. also expressed that these two factors had a mutual and interactional relationship with each other (32). Besides, healthy eating and exercise habits that encourage people to be physically healthy can increase self-esteem (33).

Ultimately, it was concluded that there was a relationship between physical activity, healthy eating attitudes, anxiety and depression, neck, back, and low back pain during social isolation. Present results are consistent with numerous research groups suggesting that exercise is beneficial for a healthy diet (32) and mental health, reducing anxiety, depression, and negative mood (34).

Limitations of our study: 1. The Hospital Anxiety and Depression Scale we used is one developed for individuals with physical health problems. 2. Since our study was conducted online, the average age of the participants is low.

A sedentary lifestyle, long-term physical inactivity, and unhealthy diet may lead to obesity, metabolic syndrome, and diabetes. It can impose adverse effects on the immune system, leaving it vulnerable to the virus. There have been pandemics throughout human history and will be so. However, as previous pandemics did not have such a dramatic influence on public health and the awareness of physical activity, healthy diet, and mental health was low, there are no public health guidelines today. A regular physical activity program and a healthy diet can be used as a protective strategy against certain disorders such as depression, anxiety, back, neck and low back pain during the outbreak in which staying at home is the most fundamental step to prevent the spread of the pandemic. It is the clinical importance of the current study. Thus, we suggest the world health organization, ministries of health, and professional organizations publish brochures and shoot films to inform people about the pandemic.

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Informed Consent: Informed consent was obtained from all participants included in the study.

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