Neck and Upper Extremity Pain and Disability Experienced by University Students with Distance Education During the COVID-19 Pandemic: Descriptive Research

Üniversite Öğrencilerinin COVID-19 Pandemisi Sırasında Yaşadıkları Boyun ve Üst Ekstremite Ağrısı ve Engelliliği: Tanımlayıcı Araştırma

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Özet

Amaç: Covid-19 pandemisi sebebiyle yüz yüze eğitim veren üniversitelerin çevrimiçi yöntemle uzaktan eğitim yöntemine geçmesi sebebiyle, haftalık ders saatleri süresince bilgisayar veya akıllı telefon ile derslere katılmak zorunda olan öğrencilerde, kas iskelet sistemi problemleri ortaya çıktı. Çalışmanın amacı; öğrencilerin yaşadıkları ağrının şiddetini belirlemek, dizabilite ile ilişkisini ortaya çıkarmak ve günlük yaşamda ağrı ve dizabiliteyi tetikleyen faktörleri bulmaktır.

Gereç ve Yöntemler: Çalışmaya 18-25 yaş arasında olan, en az 2 akademik yarıyıl boyunca uzaktan eğitime devam eden ve çalışma kriterlerini karşılayan 100 öğrenci dahil edilmiştir. Çalışmaya dahil edilen öğrencilere Sosyodemografik Veri Anketi uygulanması sonrasında Kol, Omuz ve El Sorunları Hızlı Anketi (Q-DASH), Boyun Dizabilite Anketi ve Nümerik Ağrı Skalası testleri uygulanmıştır.

Bulgular: Kol, Omuz ve El Sorunları Hızlı Anketi (Q-DASH) anketi sonucu çalışmaya dahil edilen öğrencilerin %43'ünde orta seviye dizabilite, Boyun Dizabilite İndeksi'ne göre çalışma grubunun %37'sinde tam dizabilite görüldü. Çoklu değişkenli regresyon analizine göre cinsiyet (p<0.05) ve bilgisayar veya akıllı telefon kullanım süresi (p<0.05) dizabiliteyi en çok etkileyen değişkenler olarak bulundu. Ağrı sıklığı ve üst ekstremitede dizabilite arasında anlamlı bir ilişki bulundu (p<0.001).

Sonuç: Uzaktan eğitim süresince fazla bilgisayar veya akıllı telefon kullanımının üst ekstremite ve servikal bölgede ağrı ve eklem hareket limitasyonları sebebiyle dizabiliteye neden olduğu görülmektedir.

Anahtar kelimeler: Boyun ağrıları, Covid-19 pandemisi, Uzaktan eğitim, Üst ekstremite

Abstract

Objective: Musculoskeletal system problems emerged in students who had to attend classes with a computer or smartphone during the weekly course hours, due to the fact that the universities providing face-to-face education switched to the online method of distance education due to the Covid-19 pandemic. Purpose of the study; To determine the severity of the pain experienced by the students, to reveal its relationship with disability, and to find the factors that induce pain and disability in daily life.

Material and Methods: One hundred students between the ages of 18-25, who attended distance education for at least 2 academic semesters and met the study criteria were included in the study. After the Sociodemographic Data Questionnaire was applied to the students included in the study, the Arm, Shoulder and Hand Problems Quick Questionnaire (Q-DASH), Neck Disability Index and NRS tests were applied.

Results: As a result of the Quick Questionnaire for Arm, Shoulder and Hand Problems (Q-DASH), 43% of the students included in the study had moderate disability, and according to the Neck Disability Index, 37% of the study group had complete disability. According to multivariate regression analysis, gender (p<0.05) and duration of computer or smart phone use (p<0.05) were the variables that most affected disability. A significant correlation was found between the frequency of pain and disability in the upper extremity (p<0.001).

Conclusion: It is seen that excessive computer or smart phone use during distance education causes disability due to pain and joint movement limitations in the upper extremity and cervical region.

Keywords: Covid-19 pandemic, Distance learning, Neck pains, Upper extremity

INTRODUCTION

The declaration of a worldwide pandemic due to the Covid-19 epidemic has brought about significant changes in people's lifestyles (1). The coronavirus pandemic has not only affected human life, but also affected universities and students who provide education in the field of health (2). Due to the Covid-19 pandemic, which continues with social distance principles, all face-to-face classes were suspended (3). University students began to learn and observe through various methods through distance education (4). One of the most frequently used methods is the use of a computer or smart phone and the teaching of the lessons via online video application (5). Increasing computer use can cause musculoskeletal symptoms, especially neck and upper extremity pain (6). In addition, overuse of the smartphone can exacerbate these symptoms (7). During the pandemic period, musculoskeletal disorders may occur in the neck and upper extremities of university students who receive distance education due to excessive computer or smartphone use (8). Related musculoskeletal disorders describe inflammatory and degenerative diseases, which can affect the neck, shoulder, elbow, forearm, wrist, and hands (9). Dysfunctions in these regions may occur as a result of poor posture and long-term repetitive activities, especially during computer or smartphone use, and are characterized by recurrent episodes of pain and disability (10). Although ergonomic design and training is likely to reduce the risk of developing upper extremity and neck dysfunctions associated with computer or smartphone use, it is important to identify possible factors that cause this condition (11). The aim of this study is to describe the neck and upper extremity pain and disability experienced by university students who have attended classes with distance education for at least 1 year.

MATERIALS AND METHODS

This observational-analytical study, which lasted 6 months, was designed to reveal the relationship between pain and disability in the neck and upper extremity due to computer or smartphone use of university students who have been continuing distance education with a computer or smart phone for at least 2 academic semesters using the online method.

Design of The Study

The individuals participating in the study were informed about the tests and a 'Consent form' was ob-tained from each participant. The study was approved by the Kafkas Medical Faculty Clinical Research Ethics Committee (Decision No: 169, 30/06/2021). The study was carried out on the students of Igdır University Health Services Vocational School in accordance with the Helsinki Declaration rules. A written informed consent form was signed by all patients before the study was conducted in accordance with the ethical guidelines and principles of the Declaration of Helsinki.

Participants

The participants to be included in the study were invited by e-mail and phone on a voluntary basis from students who have been attending the university with online education for at least 2 academic semesters from Igdır University Health Services Vocational School. Inclusion criteria for the study were determined as being between the ages of 18-25, continuing university education with distance education method for at least 1 year. Exclusion criteria from the study: being younger than 18 years old, being pregnant or having abortion/delivery in the last 3 months, history of surgery or implantation of cervical vertebrae, in the presence of cancer or malignant tumoral structures, infectious, inflammatory, neurological, muscle and bone tissue metabolic disease, those with a history of advanced trauma, being under psychiatric treatment, having undergone a surgical procedure on the upper extremities in the last 1 year.

Data Source/Measurements

Sociodemographic Data Questionnaire

In the sociodemographic data form sent to the participants invited for the study via e-mail, besides the physical characteristics of the participants such as age, height, weight, how often they experience pain, the effect of their pain on sleep, how many hours they use a computer or smartphone a day, how many hours they attend online classes, questions such as whether he was working in another job that could affect the extremity or cervical region were asked.

Arm, Shoulder and Hand Problems Quick Questionnaire (Q-DASH)

Q-DASH is an abbreviated version of the Arm, Shoulder, and Hand Problems (Q-DASH) questionnaire to measure physical function and symptoms in patients with upper extremity musculoskeletal conditions. The questionnaire consists of a disability/symptom scale (11 items) and two optional scales: work (4 items) and sports/performing arts (4 items). Each item in the sy-

mptom scale questions the severity of pain, activity-related pain, tingling, weakness and stiffness, difficulty in performing physical activity due to upper extremity problem, and the effect of upper extremity problem on social activities, work and sleep. Two optional modules measure the ability to study and play sports or musical instruments. Answers are given on a one to five scale, and each question is scored between 1 and 5. The Quick DASH disability scale is scored between 0 (no disability) and 100 (most severe disability), and a high score indicates severe disability (12,13). The Turkish validity and reliability of the test were performed in 2011 (14).

Neck Disability Index

The Neck Disability Index is the most widely used and most robustly validated tool for assessing disability in patients with neck pain. It has been used effectively in both clinical and research settings to treat this common problem. It is a 10-item self-report tool specifically for evaluating the physical disability of subjects with neck pain (15). Each item is scored between 0 and 5. It has been shown that the neck disability questionnaire has a high degree of test-retest reliability, internal consistency, and sensitivity to the levels of acceptable validity and changes over time (16). The disability categories for the neck disability questionnaire are: 0-4 points: no disability, 5-14 points: mild disability, 15-24 points: moderate, 25-34 points: severe, 34 and above points: complete disability. The Turkish validity and reliability of the test was performed in 2009 (17).

Numerical Rating Pain Scale

Numerical pain scale is one of the instruments used to describe the pain intensity of individuals. In the Numerical Rating Scale (NRS), patients are asked to circle the number between 0 and 10, 0 to 20, or 0 to 100 that best fits their pain intensity (18). Zero usually represents "no pain", while the upper limit represents "worst possible pain". A line length of 10 centimeters on the numerical pain scale showed the smallest measurement error compared to the other versions and seemed most appropriate for the study participants (19).

Sample Size

According to the results of the power analysis, the number of participants to be included in the study was accepted as a standard deviation of 0.5, and the G-Power program was made to be for 95% confidence interval and 80% power (20). A total of 160 people from 4 different programs were invited to the study, but 100 people who met the inclusion criteria and agreed to participate in the study and completed the questionnaires were included in the study. Dependent variables are given as Neck Disability Score and Q-DASH score. Independent variables are given as Gender, Body Mass Index, Length of Distance Education, Daily Smartphone and Computer Use, Regular Exercise, Job Status, Marital Status.

Statistical Analysis

Spss 20.0 program was used for statistical analysis. The conformity of the variables to the normal distribution was examined using visual (histogram and probability graphs) and analytical methods (Kolmogorov-Smirnov). Descriptive analyzes for normally distributed variables were given as mean and standard deviation. After the regression analysis between the dependent variable and independent variables, Multivariate Regression analysis was performed to see which independent variable affected the pain and disability scores the most. The sensitivity and specificity between the ROC Curve Plot and the upper extremity pain frequency and upper extremity disability score were examined.

RESULTS

Demographic characteristics of the participants are shown in **Table 1**.

Table 1. Age, height, weight and BMI variables of participants				
	n	Minimum	Maximum	Mean±SD
Age	100	18	25	21.23±1.80
Height(cm)	100	150	193	166.02±8.06
Weight(kg)	100	40	94	59.32±10.90
BMI (kg/m2)	100	15.1	27.7	21.40±2.86

BMI: Body Mass Index, n: Number of Participants, SD: Standard Deviation

18% (n=18) of the participants included in the study were male and 82% (n=82) were female. While 17% (n=17) of the participants included in the study stated that they "Never" experienced pain during distance education, 21% (n=21) "1-2 Times in the Last 3 Months", 19% "1-2 times a month", 18% "1-2 times a week" and 25% "more than 2 times a week" reported upper extremity and neck pain. 71% of the participants included in the study reported that the pain they experienced affected their sleep quality, while 29% reported that the pain they experienced did not affect their sleep

quality. Of the participants included in the study, 57% reported that they received distance education for 2 academic semesters, and 43% reported that they received distance education for 3 academic semesters. When the daily time spent in front of a computer or smart phone of the participants included in the study is examined, 1% of them are 0-2 hours, 13% are 2-4 hours, 20% are 6-8 hours, 25% are 8-10 hours, 6% were reported as 10-12 Hours and 10% as 12-14 Hours. It was reported that 78% of the participants included in the study did not exercise regularly, and 22% did regular exercise at least 5 days a week. While 67% of the participants included in the study did not work in any job, 21% reported that they worked in a part-time job that required the use of the upper extremity, and 12% reported that they worked in a full-time job that required the use of the upper extremity. All of the participants reported that they attended the course 30 hours a week using the online distance education method.

When the Arm, Shoulder and Hand Problems Quick Questionnaire (Q-DASH) scores of the participants included in the study were examined, it was seen that 19% of the participants had severe disability, 43% had moderate disability, and 38% had no disability (**Table 2**).

Table 2. Arm, Shoulder and Hand Problems Quick Questionnaire (Q-DASH) Scores of female and male participants

Disability Levels	Score Range	n (%)	Female (n)	Male (n)
Severe	>40	19 (19%)	18	1
Moderate	15-40	43 (43%)	39	4
No Disability	<15	38 (38%)	25	13

n: Number of participants

When the Neck Disability Index of the participants included in the study was examined, 37% had complete disability (over 34 points), 27% had severe disability (25-34 points range), 19% had moderate disability (15-24 points range), %11 Mild disability (range 5-14 points) was observed and no disability was observed in 6% (range 0-4 points) (**Table 3**).

When the Numerical Rating Pain Scale of the participants included in the study was examined, 19% had Severe Pain (7-10 Points), 36% had Moderate Pain (4-6 Points), 28% had Mild Pain (1-3 Points), It was observed that 17% did not experience pain **(Table 4)**.

Table 3. Neck disability index scores of female and male participants

Disability Levels	Score Range	n (%)	Female (n)	Male (n)
Complete	>34	37 (37%)	32	5
Severe	25-34	27 (27%)	25	2
Moderate	15-24	19 (19%)	15	4
Mild	5-14	11 (11%)	8	3
No Disability	0-4	6 (6%)	2	4

n: Number of participants

Table 4. Numerical rating pain scale scores of female and male participants

Pain Scale	Score Range	n (%)	Female (n)	Male (n)
Severe	7-10	19 (19%)	16	3
Moderate	4-6	25 (25%)	21	4
Mild	1-3	42 (42%)	32	10
None	0	3 (3%)	2	1

n: Number of Participants

Which independent variable affected the Q-DASH and Neck Disability score (dependent variables) more (Gender, Body Mass Index, Duration of Continuing Distance Education, Daily

Smartphone or Computer Use, Regular Exercise, A Factor Affecting the Upper Extremities) of the patients participating in our study. Multivariate regression analysis was performed to find Employment Status, Marital Status). According to this analysis, it was observed that the independent variables directly affected the Q-DASH score by 30.5% ($R^2=0.305$) and the Neck Disability score by 33.1% ($R^2=0.331$). In the Anova test, which was performed to see how significant the results of both regression analyzes we performed were, the variance we revealed was statistically significant since both of them were $p<0.0001$. In other words, it was correctly estimated which independent variable affected the Q-DASH score and the Neck Disability score. Among the independent parameters, Gender ($p=0.011$, $p=0.010$) and Daily Smartphone and Computer Use ($p=0.034$, $p=0.006$) were found to be more effective (**Table 5** and **Table 6**).

Table 5. Multivariate regression analysis table between Q-DASH dependent variable and independent variables				
Model	**R**	**R²**	**Adjusted R²**	**Standard Error**
	0.553a	0.305	0.236	16.8982
Anova	Sum of squares	Df	F	Sig.
Regression	11298.113	9	4.396	<0.001b
Residual	25699.327	90		
	36997.440	99		
Dependent variable	**Independent variables**	**Beta**	**T**	**Sig.**
Q-DASH Score	Gender	-0.255	-2.587	0.011*
	Body Mass Index	-0.087	-0.862	0.391
	Distance Education Period	-0.039	-0.407	0.685
	Daily Smartphone and Computer Use	0.201	2.148	0.034*
	Regular Exercises	-0.040	-0.419	0.676
	Working Condition at Work Affecting Upper Extremity	-0.028	-0.306	0.761
	Marital status	0.071	0.688	0.493

The symbol indicated with * indicates statistical significance according to the t test result (p<0.05)

a: Dependent variable - Q-DASH score

b: Independent variables- Gender, Body Mass Index, Length of Distance Education, Daily Smartphone and Computer Use, Regular Exercise, Job Status, Marital Status

Table 6. Multivariate regression analysis table between the dependent variable of Neck Disability Score and independent variables				
Model	**R**	**R²**	**Adjusted R²**	**Standard Error**
	0.576a		0.331	0.264	15.9638
Anova	Sum of squares	Df	F	Sig.
Regression	11364.278	9	4.955	<0.001b
Residual	22935.882	90		
	34300.160	99		
Dependent Variable	**Independent Variable**	**Beta**	**T**	**Sig.**
Neck Disability Index	Gender	-0.253	-2.614	0.010
	Body Mass Index	0.040	0.402	0.688
	Distance Education Period	-0.090	-0.968	0.336
	Daily Smartphone and Computer Use	0.259	2.814	0.006
	Regular Exercises	0.039	0.415	0.679
	Working Condition at Work Affecting Upper Extremity	-0.153	-1.707	0.091
	Marital status	0.147	1.451	0.150

The symbol indicated with * indicates statistical significance according to the t test result (p <0.05)

a: Dependent variable - Neck Disability score

b: Independent variables- Gender, Body Mass Index, Length of Distance Education, Daily Smartphone and Computer Use, Regular Exercise, Job Status, Marital Status

Using ROC Curve Analysis, Upper Extremity Pain Frequency (constant variable) and Q-DASH (test result variable) were compared and it was tried to determine the frequency of pain experienced by the participants and the sensitivity and specificity of disability. As a result of the test, the Area Under the Curve (AUC) value was found to be 69.9%, which showed us that the frequency of pain was 69.9% successful in determining disability in the upper extremity. Since p=0.001 (p<0.05) in the analysis, the test is statistically significant. In the test performed, the "cut off" value was found to be 21, and this value showed that the sensitivity of pain in determining disability was 63.2% and the specificity was 62.9% when the disability score obtained in the Q-DASH questionnaire was above 21 (**Figure 1**).

DISCUSSION

As a result of our study, pain and disability were observed in the upper extremity and cervical region due to the use of computers and smartphones in university students receiving distance education using the online method. There was also a significant relationship between the incidence of pain and disability.

Pain and disability were observed in the upper extremities due to the fact that the students participating in our study took 30 hours of lessons per week and used computers and smartphones for more than 4 hours a day. Similarly, in the study by Blatter et al., upper extremity and cervical region disorders related to work-related computer or mouse use were examined and the relationship between the duration of computer use and the frequency of occurrence of these disorders was investigated. It was observed that the risk of extremity disorders increased (21).

In the students who participated in our study, it was observed that the neck and upper extremity pain and disability scores of female students were higher than male students. Similarly, in the study by Rodriguez et al., in which the prevalence of musculoskeletal pain was investigated in student groups of two Spanish Universities during quarantine, female students were more likely to have pain and disability in the neck, shoulder, elbow and wrist than male students which pain and disability were observed (22).

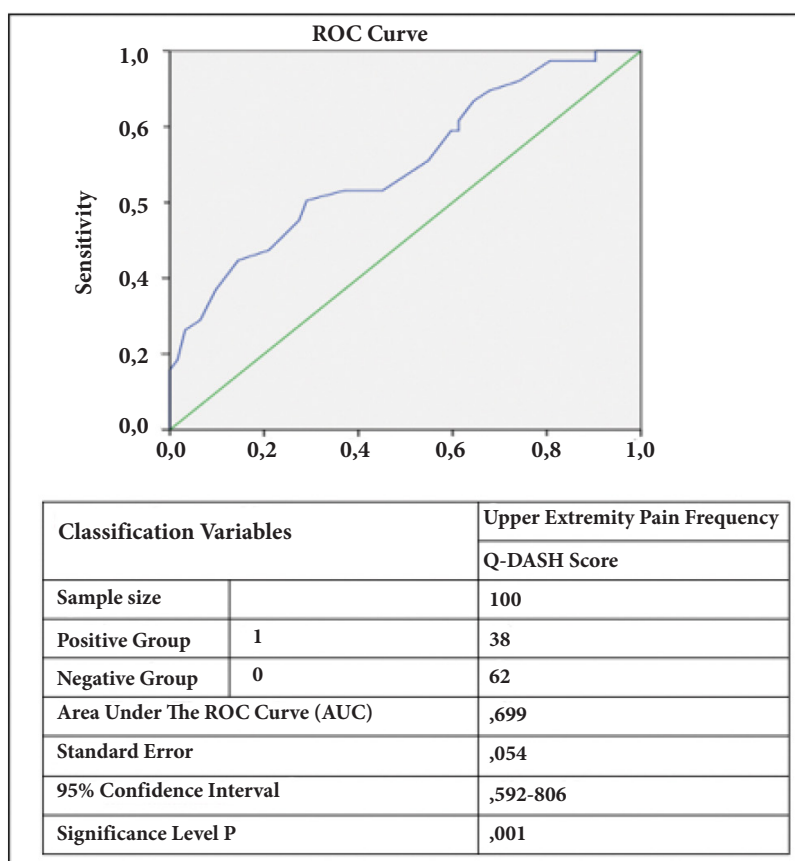In the study conducted by Arshad et al., ergonomic applications and musculoskeletal problems were inves-

Figure 1. Determination of the Sensitivity and Specificity of the Upper Extremity Pain Frequency and Upper Extremity Disability Score of the Participants by ROC Curve Analysis

tigated among university students while using a laptop, the prevalence of upper extremity musculoskeletal problems was found to be high in university students using laptop computers, and the number of hours spent in front of the computer was found to be high laptop position and external keyboard use showed a significant relationship with musculoskeletal problems (23).

In the study conducted by Gerding et al., musculoskeletal problems experienced by academic staff who continue their education at home, such as students during the pandemic, were investigated and more than 40% of the participants had moderate to severe disability findings in the neck, upper extremities, and lumbar region (24).

In the study conducted by Singh et al., the effect of online education on students' health was examined and five universities were selected to collect data and a questionnaire was sent to the students. It was concluded that musculoskeletal system diseases may occur due to the increase in weight and long static posture (25).

In the study by Daher et al., the relationship between neck pain and disability was examined in university students who participated in distance education using the online method, and at least 35% of this population had moderate disability and limited joint movement. Similar to our study, NRS scores were associated with a moderate risk of neck-related disability (26).

This may affect the results, as the web-based devices used by the participants included in our study to attend the course are not differentiated whether they are computers or smartphones. This may also affect the results, as it is not reported whether the computers used are used with an ergonomic desk and chair, or with an ergonomic support when using a smartphone.

CONCLUSION

As a result of our study, it was observed that the use of computer or smartphone during distance education caused disability in the musculoskeletal system, especially in the upper extremity and cervical region, due to pain and joint movement limitations. In future studies, if distance education models continue, ergonomic arrangements and protective exercise programs should be planned for these student groups along with trainings and practices.

Conflict of Interest: No conflict of interest was declared by the author.

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