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Research Article

Occupational Stress and Its Association with Musculoskeletal Disorders in University Teachers during COVID-19 Pandemic

Aasiya Pashtana^{1*}, Amina Saeed², Asma Naseer², Laraib Anum², Misbah Ghous²

¹Department of Rehabilitation Sciences, Shifa Tameer e Millat University, Islamabad, Pakistan

²Riphah International University, Islamabad, Pakistan

*Correspondence: aasiyakhan384@gmail.com

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Abstract

The Coronavirus disease (COVID-19) was first observed near the end of 2019, and soon after it became a turning point for the world. Almost all the academic institutes remained closed. This led to the adoption of a 'hybrid teaching style' and work from home became the *modus operandi* for the teachers during the pandemic. The COVID-19 pandemic compounded occupational stress, which is why teachers' mental and physical health suffered tremendously, giving rise to anxiousness, pressure, headaches, musculoskeletal complications, and bodily exhaustion. The objective of this study was to determine the frequency of occupational stress and its association with musculoskeletal disorders (MSDs) in university teachers during the COVID-19 pandemic. This cross-sectional study was conducted from August 2021 to February 2022, within 6 months duration, after the approval of IRB & EC of Riphah International University, Islamabad. Data was taken from three cities in Pakistan (Rawalpindi, Islamabad, and Bahawalpur). It included 347 full-time teachers aged 25 to 59 from 7 government and private universities. The study utilized the Teachers Stress Inventory (TSI) and Nordic Musculoskeletal Questionnaire (NMQ) to assess stress frequency and musculoskeletal pain, respectively. The mean age of participants was 33 ± 6 years. Out of 347, 49.5% of teachers were from government universities and 50.4% were from private universities. The results revealed that the frequency of stress levels was 119 ± 27.2 in government teachers and 109 ± 18.3 in private teachers. Among government university teachers, 60.4% reported musculoskeletal discomfort, while only 32.8% of the participants from private universities reported discomfort. This study described the weak association ($r = 0.08$) and non-significant relationship ($p > 0.05$) between occupational stress and musculoskeletal discomfort. The study concludes that mild stress levels were found in university teachers during the COVID-19 pandemic. There was a weak correlation between stress and musculoskeletal disorders.

Keywords: Occupational stress, University teachers, Nordic musculoskeletal questionnaire, teacher stress inventory, COVID-19, Musculoskeletal disorders, e-learning.

1. Introduction

COVID-19 was first reported near the end of 2019, which led to a global pandemic and several deaths. World Health Organization declared it to be a pandemic on 12th March 2020. The rapid rise in viral infections forced governments to implement safety protocols such as lockdowns, quarantine, and several other restrictions to minimize the spread (Atalan 2020). These lockdowns, in the blink of an eye, transformed the lifestyles and occupational protocols of all professionals, including teachers.

(Sathishkumar 2020, Lokanath Mishraa 2020). Due to this psychosocial and musculoskeletal problems became prevalent among teachers. Most schools, colleges, and universities shut down to curtail person-to-person transfer and the spread of the virus. The online education system replaced the physical education system in a short period of time. Work from home became a new norm, and digital pedagogy put teachers mentally and physically through new stresses (Kayabınar 2020). Teachers had to learn new technology to teach online and design their

education and learning model. This also led to an intrusion in their private lives, especially with students and parents/guardians on a more frequent basis. Due to work overload, these teleworking conditions caused various health conditions in teachers, including depression, anxiety, stress, burnout syndrome, and physical problems (Pablo A. Lizana 2021).

Occupational stress at the workplace negatively affects a teacher's health through anxiousness, pressure, headaches, musculoskeletal complications, and bodily exhaustion. There are several reasons behind mental health problems, including high job demands and low income. (Mohamed 2018). It has a major effect on their quality of life, sense of satisfaction, and overturn from jobs. It has been observed that teachers experience musculoskeletal issues related to their mental health more frequently than people with other professions. Recently, researchers have shown that psychosocial factors play an important role in the development of musculoskeletal disorders (MSDs). It has been established that there is a strong link between the two (Yi Ming Ng 2019). The biological stress response is activated by repeated and continuous exposure to stressors. This may cause long-term stress and pressure-related health issues. Several studies have shown that psychological problems including depression and anxiety can increase the risk of MSDs (Naima Akhtar Malik 2018).

Teachers are frequently observed to have MSDs. Muscles, ligaments, tendons, and other soft tissues are affected by a variety of inflammatory and degenerative conditions. They may have severe symptoms such as recurrent pain, stiff joint swellings, etc. (Patience N. Erick 2015). Most teachers have bad physical postures because of their one's own and job-related aspects such as prolonged working hours, taking no breaks for rest, excessive usage of smart devices, wearing of glasses, pressure, tension, and anxiousness. Their postures may also be affected wrong positioning of the laptop

or computing device and keypad or computer mouse, the selection of an unsatisfactory seat and desk for working, or while taking online classes on smart devices. Other factors that may affect MSDs include making bad postures like bending and kneeling and it also depends on the environmental and physical conditions of the room. All of these factors can be associated with musculoskeletal disorders in teachers (Blasko 2020). Teachers are also seen to have physical issues like lower extremities MSD due to sustained kneeling, stooping, or bending (Argus 2021). The resulting stress can have long-term consequences e.g., psychological adjustment, physical fitness as well as social functioning (Gaziel 2015, Adamovic 2021).

Teachers have to deal with prolonged sitting and high workloads in an online education system (Borg 2014), which may lead to further stress, tension, anxiousness and depression, and disagreement with a manager and colleague (Kaur 2011, Buomprisco et al. 2021). This, along with several other factors may lead to physical health problems (Smith 2011, Kaur 2011).

Several studies show that occupational conditions involving multiple risk factors can lead to musculoskeletal difficulty (Rodríguez-Nogueira et al. 2021). The most common causes of musculoskeletal disorders are incorrect posture; repetitive working without taking rest breaks environmental temperature, room conditions, and working hard (Enrique Piñero-Fuentes 2021).

As we discussed before same as occupational musculoskeletal disorders are caused or aggravated by repetitive movements, unhealthy working conditions, excessive force, long-term repetitive tasks, poor working conditions, the underlying effects of work and conditions (Gerding 2021, César Larrea-Araujo 2021) (Strydom 2016). In addition, psychological distress is another factor that should be taken into account. Teachers experiencing psychological distress may be suffering from depression, anxiety, or a combination of these

Table 1: Frequency and percentage of demographics of the investigated sample.

Variable	Frequency (n)	Percentage (%)
Gender	347	100
Male	146	42.1
Female	201	57.9
Marital status		
Married	218	62.8
Unmarried	129	37.2
Employment status		
Government teachers	172	49.5
Private teachers	175	50.4
Mode of teaching		
Online	17	4.9
On campus	190	54.8
Hybrid	140	40.3
Duration of daily working		
6 hours	158	45.5
6-12 hours	189	54.5
Duration on laptop/computer		
3-6 hours	260	74.9
> 6 hours	87	25.1
Teaching years (experience)		
2-5 years	81	23.3
5-8 years	117	33.7
9-12 years	90	25.9
>12 years	59	17.0
Field		
Medical	174	50.1
Non-medical	173	49.8
Administrative working hours		
1-3 hours	115	33.1
4-6 hours	145	41.8
>6 hours	87	25.1
Management support required		
Yes	180	51.9
No	167	48.1
Co-worker support needed		
Yes	243	70.0
No	104	29.9

conditions (E. N. Zamri 2017). In addition, MSDs can result from metabolic and immunological disorders, such as obesity, diabetes, or rheumatoid arthritis. Those employees who are starting a new job are more likely to develop

MSDs. One possible reason is that they are not physically prepared for the job (César Larrea-Araujo 2021). Therefore, the objective of this study was to determine the frequency of occupational stress and its association with

Table 2: The table shows the mean and SD of TSI score.

Variable	Mean± SD
TSI total score	111.68±19.76
Domains of TSI	
1. Role ambiguity	13.22± 0.15
2. Role stress	9.03± 0.13
3. Organizational management	14.42± 0.20
4. Job satisfaction	18.2± 0.30
5. Life satisfaction	22.1± 0.29
6. Tasks stress	9.41± 0.13
7. Supervisory support	24.2± 0.30

musculoskeletal disorders (MSDs) in university teachers during the COVID-19 pandemic.

2. Methods & Materials

It was a cross-sectional study with a sample size of 347 recruited through a non-probability, convenient sampling method. The study was conducted in private and government institutes of Islamabad / Rawalpindi, and Bahawalpur, Pakistan. The study duration was 6 months after the approval of IRB & EC of the Riphah International University, Islamabad. Participants that were included in the study were male and female teachers of universities, employed permanently, with at least 2-years' of experience, taking online classes, and having MSDs. Teachers with diagnosed depression or general anxiety, any other psychiatric issues, and any diagnosed systemic, neurological, or autoimmune disease were excluded. Data was collected after obtaining informed consent. Initial demographics were noted through a self-structured questionnaire. TSI and Nordic were used to obtain data regarding stress and MSD.

2.1. The Teacher Stress Inventory (TSI)

The TSI identifies the types of situations teachers reported as stressful and an overall stress score. The shortened version has 36 items that are rated on a 5-point Likert scale. These items were grouped into seven categories which include:

role ambiguity, role stress, organizational management, job satisfaction, life satisfaction, task stress, and supervisory. Participants scoring in the bottom 25th percentile of the TSI scores were categorized as experiencing low levels of stress. Participants scoring between the 25th and 75th percentiles of the TSI scores were categorized as experiencing medium levels of stress while participants scoring in the top 25th percentile of the TSI scores were categorized as experiencing high levels of stress (Fimian 1984).

2.2. The Nordic Musculoskeletal Questionnaire (NMQ)

The NMQ was developed from a project funded by the Nordic Council of Ministers. The aim was to develop a standardized questionnaire methodology allowing comparison of low back, neck shoulders, and other general complaints for use in epidemiology studies. Its reliability is 0.57-0.90 (Crawford 2007).

2.3. Statistical Analysis

Data was analyzed using SPSS 21. Mean, Standard Deviation (SD), frequency, and percentages of different variables were calculated. Bivariate analysis was conducted using Spearman's correlation for ordinal variables, and Pearson correlation for continuous variables, in order to verify various factors. A comparison between the medical/non-medical and government/private was done

Table 3: Comparison of TSI in Government and Private Institutes.

Institutes	Means \pm SD TSI	P-Value
Government	109.57 \pm 21.80	0.05
Private	113.76 \pm 18.0	

through an independent sample t-test. Simple linear regression was applied to find the association between different variables. $P < 0.05$ was considered statistically significant.

3. Results

Of the total number of teachers (347), 146 were males (42.1%) and 201 were females (57.9%) (Table 1). 218 of the participants are married, making up (62.8%) and there were 129 unmarried participants (37.2%). Out of the total 347 participants, 168 were government teachers (48.4%) and private teachers were 179 (51.6%). Out of the total 347, 17 teachers were teaching online (4.9%), 190 teachers were teaching on campus (54.8%) and 140 are those who were teaching hybrid (40.3%).

The mean of the teacher stress inventory (Table 2) showed that the TSI total score was (111.68 \pm 19.76) and its first domain, role ambiguity mean and SD scored (13.22 \pm 19.76). The second domain, role stress mean and SD score was (9.03 \pm 0.13). The organizational management mean and SD score was (14.42 \pm 0.20). Job satisfaction means and SD score was (18.2 \pm 0.30). Life satisfaction score was (22.1 \pm 0.29). Tasks stress score was (9.41 \pm 0.13). The supervisory support score was (24.2 \pm 0.30). The result showed mild stress in university teachers.

Table 3 shows the comparison of TSI in government and private institutes. The mean and standard deviation scores of the two groups indicated that private teachers scored slightly higher levels of stress (113.76 \pm 18.0). On the other hand, government teachers scored lower levels of stress (109.57 \pm 21.80). Whereas the p-value ($p=0.5$) remained the same for both government teachers and private teachers.

As shown in Table 4, the correlation analysis between the NMQ and TSI revealed that, among teachers, over the last 12 months, neck pain showed a strong positive correlation ($r = 0.08$, $p = 0.13$), though not statistically significant. Shoulder pain demonstrated a moderate negative correlation ($r = -0.56$, $p = 0.29$), also not statistically significant. Upper back pain in the last 12 months scored a very weak negative relation ($r = -0.01$) and non-significant relationship ($p=0.79$). Whereas elbow pain in the last 12 months has scored a very weak negative relation ($r = -0.08$) and non-significant relationship ($p=0.09$). Additionally, wrist/hand pain, over the same period, scored a very weak positive relation ($r = -0.00$) and a non-significant relationship ($p=0.97$). Similarly, lower back pain scored very weak positive relation ($r=0.02$) and non-significant relationship ($p=0.64$). Hips/Thighs pain in the last 12 months has scored weak negative relation ($r = -0.10$) and significant relationship ($p=0.05$). Knee pain in the last 12 months has scored a very weak negative relation ($r = -0.02$), and a non-significant relationship ($p=0.70$). Ankles/Feet in the last 12 months have scored very weak negative relation ($r = -0.07$) and non-significant relationship ($p=0.15$).

4. Discussion

The aim of the present study was to determine the frequency of occupational stress and its association with MSDs among university teachers during the COVID-19 pandemic. Our findings indicate that the majority of survey participants were women. The majority of teachers had been teaching online for about 5 to 8 years. Despite the fact that a majority of private university employees work in medical

Table 4: The table shows the correlation of TSI with NMQ.

Anatomical region	r- value	P- Value
Neck		
Neck pain (12 months)	0.08	0.13
Neck pain (Prevented normal activities)	-0.07	0.14
Neck pain (seen physician)	0.05	0.31
Neck pain (last 7 days)	0.02	0.63
Shoulder		
Shoulder pain (12 months)	-0.56	0.29
Shoulder pain (prevented normal activities)	-0.07	0.14
Shoulder pain (seen physician)	0.007	0.90
Shoulder pain (last 7 days)	-0.08	0.11
Upper back		
Upper back pain (last 12 months)	-0.01	0.79
Upper back pain (prevented normal activities)	-0.06	0.20
Upper back pain (seen physician)	-0.09	0.07
Upper back pain (last 7 days)	0.01	0.79
Elbows		
Elbows pain (last 12 months)	-0.08	0.09
Elbows pain (prevented normal activities)	-0.07	0.16
Elbows pain (seen physician)	-0.00	0.87
Elbows pain (last 7 days)	0.01	0.79
Wrists/Hands		
Wrists/Hands pain (last 12 months)	0.00	0.97
Wrists/Hands pain (prevented normal activities)	0.01	0.78
Wrists/Hands (seen physician)	-0.03	0.52
Wrists/ Hands (last 7 days)	0.01	0.72
Lower back		
Lower back pain (last 12 months)	0.02	0.64
Lower Back pain (prevented normal activities)	-0.01	0.81
Lower back pain (seen physician)	-0.04	0.31
Lower back pain (last 7 days)	-0.04	0.37
Hips/Thighs		
Hips/Thighs pain (last 12 months)	-0.10	0.05
Hips/Thighs pain (prevented normal activities)	-0.09	0.08
Hips/Thighs pain (seen physician)	0.04	0.39
Hips/Thighs (last 7 days)	-0.10	0.05
Knees		
Knees pain (last 12 months)	-0.02	0.70
Knees pain (prevented normal activities)	-0.03	0.49
Knees pain (seen physician)	0.01	0.80
Knees pain (last 7 days)	0.06	0.24
Ankles/Feet		
Ankles/ foot pain (last 12 months)	-0.07	0.15
Ankles/Feet pain (prevented normal activities)	0.00	0.95
Ankles/Feet pain (seen physician)	-0.42	0.44
Ankles/feet pains (last 7 days)	0.04	0.42

professions, they nevertheless rely on coworkers and other employees for assistance. However, teaching appears to be a predominantly female profession, with the majority of female teachers teaching online for around 10 years (Yazon and Ang-Manaig 2019).

In the current study, the mean score of TSI for university teachers was in the range of mild stress (111.68 ± 19.76). In the literature, it is noted that teacher performance significantly improved with increased encouragement and support from higher authorities, highlighting a principal's role in leading, managing, mentoring, and supporting teachers to facilitate such improvement (Pambudi and Gunawan 2020). The goal of supervision is to provide professional assistance and improvement in order to enhance tutoring and knowledge acquisition. In the context of good performance from all of these employees, education enhanced the utility and competency of coaching and learning (Pambudi and Gunawan 2020).

According to the NMQ, most respondents reported suffering from neck pain in the previous 12 months and 7 days, which interfered with their everyday activities. The majority of them needed to visit a doctor because they were experiencing lower back discomfort. According to a similar study carried out in 2022, neck discomfort caused a decline in daily activities over the past 12 months and 7 days (Sunny et al. 2022).

The current study's findings revealed that during COVID-19, the majority of study participants experienced musculoskeletal problems, in at least one anatomical region, due to stress at work. The neck, shoulder, wrist, and hand were most commonly afflicted over the past twelve months, while upper back and elbow complaints were reported more frequently in the past seven days. Furthermore, the majority of the teachers experienced some form of limitation in their activities as a consequence of ankle/foot discomfort, and the majority of them also needed to visit a doctor for

shoulder pain. However, contrary to our findings, a study published in 2018 found that the lower back area was the most common source of painful sensations, not only in the past twelve months but also in the previous seven days. Furthermore, most of the employees reported some type of activity limitation as a result of lower back pain; moreover, a majority of them were required to see a doctor for lower back pain (Almeida and Dumith 2018b).

Our findings revealed that there is no link between the TSI and upper and lower limb musculoskeletal pain symptoms in all anatomical locations, with the exception of lower back pain, which requires medical attention. In contrast, a study published in Brazil by (Almeida and Dumith 2018a) found that there was a positive linear correlation between perceived stress and the incidence of musculoskeletal pain symptoms in all anatomical locations, with the exception of the hip area (Almeida and Dumith 2018b).

This study has some limitations which need to be pointed out. First, the study used cross-sectional data from only three cities. Longitudinal studies are highly recommended; however, they require a larger research budget than was available for the present research project. Occupational stress may vary between professions, and the findings may not be generalized to other professions than university teachers. Furthermore, this study only included two aspects of health (mental, and musculoskeletal); future research should preferably examine other health issues. A gender-based comparison was not done due to the unequal sample size.

This study has several implications. The findings suggest that occupational stress in higher educational institutions may decrease mental and musculoskeletal health. Therefore, the results suggest that there is an urgent need to reduce occupational stress in the university work environment. Workshops and seminars on stress management should regularly be

conducted as a preventive measure. Physical activity in the workplace should be introduced as it may improve mental health and reduce MSDs.

5. Conclusion

We conclude that mild stress is reported by a majority of the participants and the most common musculoskeletal symptoms present in university teachers during the COVID-19 pandemic were found in the neck, shoulder, and hands.

Conflict of Interest

The authors declare that they have no conflicts of interest to disclose.

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There were no funding contributions for this research from any source.

Study Approval

This study was approved by the review board of the Riphah International University, Islamabad, Pakistan.

Consent Forms

Every participant signed a consent form before participating in the research.

Authors Contributions

AP conceptualized the study and wrote the final manuscript, AS, AN, and LA did the experimental part and analysis of the results, MG supervised the whole project.

Data Availability

All the data relevant to this study is with the authors.

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