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IMPACT OF OCCUPATIONAL STRESS ON MUSCULOSKELETAL DISORDER AMONG OFFICE WORKERS

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ABSTRACT

Objective: To investigate the impact of occupational stress on musculoskeletal disorders (MSDs) among office workers, focusing on the prevalence, severity and associated risk factors.
Study Design: It was an observational cross-sectional study.
Place and Duration of Study: The study was done by collecting data from different banks, clinics, hospitals, institute of Sialkot Faculty computer IT departments of University of Sialkot. The study was completed within 6 months after the approval from research committee.
Materials and Methods: An observational cross-sectional study was conducted among 405 office workers aged 20–50 years in Sialkot. Participants were selected using non-probability convenient sampling from various clinics, hospitals, banks and institutes. Inclusion criteria included full-time desk-based work for at least six months with a minimum of six working hours per day. Data were collected using the Nordic

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Musculoskeletal Questionnaire (NMQ) and the Dutch Musculoskeletal Questionnaire (DMQ) to assess musculoskeletal discomfort and occupational stress. Validity and reliability of the tools were established through content, construct and criterion validation as well as test-retest and internal consistency analyses. Data were analyzed using SPSS Version 26.0 with Pearson correlation applied to examine associations between MSD variables and occupational stress factors.

Result: Of n = 405 participants (mean age 32.4 years), 181 (45%) were male and 224 (55%) female. Neck discomfort in the past 12 months was reported by 197 (48.6%), with 259 (64%) having limited movement. Shoulder pain affected 204 (50.4%)—right in 92 (23%), left in 61 (15%), and both in 102 (25%). Elbow discomfort was noted in 117 (28.9%), mainly right-sided (103, 25.4%). Wrist and upper back discomfort were reported by 207 (51.1%) each, while lower back pain was highest at 237 (58.5%). Thigh discomfort affected 184 (45.4%), knee 134 (33.1%), and ankle 163 (40.2%). Regarding work, 216 (53.3%) had <5 years of experience, 166 (40.1%) 6–15 years, and 23 (5.7%) >25 years. Part-time or casual jobs were common (237, 58.5%). Nearly half worked >8 hours daily, with many engaged in physical labor (50.6%) and repetitive tasks (63%). Trunk twisting was reported by 210 (51.9%), heavy lifting 169 (41.7%), static postures 206 (50.9%), and working with arms overhead 231 (57%). Exposure to extreme temperatures or wet clothes was noted by 190–244 (46.9–60.2%). Pearson correlation showed significant links: neck with ORF5 (p=0.048), shoulder with ERF8 (p=0.001), elbow with ERF6 (p=0.02), wrist with ERF6 (p=0.001), upper back with ERF3 (p=0.001), thigh with ERF3 (p=0.013), ankle with ERF2 (p=0.024), and thigh at 7 days with ORF9 (p=0.009).

Conclusion: This study shows that there is a significant correlation between occupational factors, such as repetitive tasks, prolonged working hours and physical labor, with musculoskeletal discomfort in various body regions, including neck, shoulders, elbows, wrists, upper back, lower back, thighs, knees, and ankles. These findings indicate that certain work-related activities increase the risk of musculoskeletal disorders, emphasizing the need for ergonomic interventions and preventive measures in the workplace.

Keywords: Musculoskeletal disorders, Occupational stress, Nordic Musculoskeletal Questionnaire, Dutch Musculoskeletal Questionnaire

INTRODUCTION

Musculoskeletal disorders (MSDs) are among the most common work-related problems. MSDs are related to the muscles, joints, tendons and nerves that can affect body regions, such as neck, upper limbs and back (1). Work-related musculoskeletal disorders (WMSDs) are considered as the main contributing factor in job absenteeism, presentism, reduced quality of life, change of occupation, increment of work related injuries, and increased medical expenses due to disability (1).

In many occupations, people spend long hours in front of a computer. Office personnel spend most of their time in offices in a seated position. Use of computers has increased in workplaces, which is associated with MSDs-related symptoms with a prevalence rate of more than 50% especially in the upper extremities and lower back (2). Also,

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pain/discomfort caused by MSDs, in the neck, shoulders, and lower back, are common among office workers due to the time spent in a sitting position (3).

Worldwide, MSDs are widespread and have both socioeconomic and personal consequences. Work-related MSDs and pain/discomfort are related to prolonged sitting position, fast-paced work, static and awkward postures, and highly repetitive movements (4). In addition, inappropriate and inadequate workplace conditions can cause MSDs and affect people's wellbeing and welfare as well as reduce productivity (5).

Physical work environment factors such as noise, poor lighting, and improper workstation design also contribute to increased stress levels (6). Gastrointestinal problems and sleep disturbances were significantly related to more stressors than other symptoms examined. These findings show that it is important to examine physical symptoms, as they are related to a wide range of job stressors and these relationships prevail over time. Workplace stress manifests through a combination of physical, emotional, and behavioral symptoms (7).

Office workers regularly participated in stationary assignments including delayed PC use and tedious hand developments, are especially powerless to both RSI and work environment stress. The mix of tedious errands and high work strain can compound actual sicknesses and emotional wellness issues (8).

Ageing is inevitable, the benefits of exercise on the ageing body are numerous and, in some circumstances, can reduce the manifestations of ageing, particularly the "ageing phenotype" of the elderly (9). A recent systematic review looked at evidence supporting nutrition and physical activity in the prevention and treatment of sarcopenia (10).

Sarcopenia results in loss of muscle strength and mass and this can lead to weakening of musculoskeletal structures and impair tendon, ligament, bone and cartilage function, which will destabilize the joint and increase the risk of arthritis and other musculoskeletal disorders (11). Physical exercise improves muscle performance by increasing the ratio of type I to type II muscle fibers and increasing the cross-sectional area of type II muscle fibers (12).

Management of musculoskeletal diseases should start with proper and complete pain management, including accurate diagnosis and grading of pain. As discussed previously, pain from musculoskeletal conditions severely affects patients' quality of life (11). In humans, paracetamol and non-steroidal anti-inflammatory drugs (NSAIDs) are most often prescribed to treat OA pain, with some clinicians preferring paracetamol/opioid combinations or an opioid alone, depending on patient age and other comorbidities (for example, renal disease, diabetes, hypertension, gastrointestinal, etc.) (13).

These medications may be appropriate for the majority of patients, however, there are some barriers to optimal pain management, including patient compliance, self-medication and lack of monitoring by the clinician (7). It is recognized that opioid misuse in the U.S. has reached epidemic proportions, for which the U.S. Department for Health and Human Services has announced a new combative strategy. Therefore, other treatment options may need to be considered if the pain cannot be appropriately controlled or if the prescription of particular medications is problematic in that country (11).

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The rationale for this study is anchored in the necessity to address the intersection of occupational stress and musculoskeletal health among office workers. The implications of this research extend beyond individual health concerns to broader workplace dynamics, highlighting the need for integrated approaches to occupational well-being. As organizations strive to create healthier work environments, the findings from this study will contribute to the formulation of evidence-based strategies that enhance employee health, productivity, and overall job satisfaction.

MATERIALS AND METHODS

The study was cross-sectional and observational. In this investigation, non-probability convenient sampling was employed. After receiving clearance from the research committee, the study was finished in six months and involved gathering data from several banks, clinics, hospitals, and the University of Sialkot's Institute of Sialkot Faculty computer IT departments. The sample size 405 was determined using Raosoft software.

Inclusion criteria included office workers aged 20 to 50 years, individuals working in desk-based or computer-based jobs for at least 6 months, employees working a minimum of 6 hours per day, 5 days a week, full-time office employees and participants willing to participate. The study excluded individuals working in industries outside of retail, such as healthcare, construction or office based jobs, people who had been diagnosed with long-term illnesses, retailers with neurological conditions who had surgery or trauma within the past year and individuals without any reported MSK complaints (14).

The NMQ is a 34-items questionnaire intended to assess musculoskeletal discomfort and pain among employees, helping identify work-related ergonomic issues (15).

The NMQ has high content validity because it comprehensively Several studies have shown that NMQ scores correlate well with other measures with ICC value >0.88 of musculoskeletal health and ergonomic risk factors, supporting good construct validity (16). Studies have demonstrated well to excellent test-retest reliability. For example, a study by Dickinson et al. (1992) showed kappa values ranging from 0.60 to 0.81 (Chomitz et al., 2009).

The **Dutch Musculoskeletal Questionnaire (DMQ)** is a tool used to assess work-related musculoskeletal disorders (MSDs) and associated risk factors. ICC test-retest method was used to verify the repeatability of the final questionnaire. This questionnaire is reliable (17). This questionnaire is valid according to minimum acceptable value to confirm each item was considered at 0.78 agreement (16).

RESULTS

The data was analyzed by using the SPSS Version 26.0. For analysis, the correlation is found by using Pearson correlation test. As a cutoff for significance, the level $p<0.05$ was used, while $p>0.05$ was regarded as insignificant.

Table 1: Frequency of male and female

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http://amresearchreview.com/index.php/Journal/about
Volume 3, Issue 10(2025)

Online ISSN 3007-3197
Print ISSN 3007-3189

http://amresearchreview.com/index.php/Journal/about

Gender Of Respondent			Age in Year	
	Frequency	**Percentage**	**Frequency**	**Percentage**
Male	181	45	122	30.1
Female	224	55	215	53.1
Total	405	100	405	100

TABLE 2: Frequency Of Musculoskeletal Discomfort and Pain among Office Workers

Discomforts	Yes		No	
	frequency	**percentage**	**frequency**	**Percentage**
Neck	251	62	154	38
Shoulder	194	47.9	211	52.1
Elbow	115	62	290	38
Wrist	161	38.9	244	60.2
Upper Back	161	38.9	244	60.2
Lower Back	163	40.2	242	39.8
Thighs	115	28.4	290	71.6
Knees	90	22.2	315	77.8
Ankle	101	24.9	304	75.1

TABLE 3: FREQUENCY OF DMQ VARIABLES

Variables		Frequency	Percentage
WORKED IN SAME ENVIRONMENT(ORF 1)	Less than 5 yrs	216	53.3
	6-15 yrs	166	40.1
	More than 25 yrs	23	5.7
PART TIME/ CASUAL EMPLOY(ORF 2)	NO	168	41.5
	Yes	273	58.5
HOURS PER DAY	Less than 7 days	179	44.2
	More than 7 days	226	55.8
WORKING HOURS PER DAY	8hrs or less	206	50.9
	More than 8 hrs	199	49.1
SHORTAGE OF	No	200	49.4

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http://amresearchreview.com/index.php/Journal/about

STAFF	Yes	205	50.6
PHYSICAL LABOUR	No	200	49.4
	Yes	205	50.6
ROTATION IN WORK	No	199	49.1
	Yes	206	50.9
WORK OVERTIME	No	209	51.6
	Yes	196	48.4
REST TIME	No	191	47.2
	Yes	214	52.8

TABLE 4 : FREQUENCY OF NORDIC VARAIBLES

Variables		Frequency	Percentage
WORK INVOLVE DOING REPETITIVENESS TASK	No	150	37
	Yes	255	63
WORK INVOLVE STANDING FOR EXTENDED PERIODS	No	125	30.9
	Yes	280	69.1
INVOLVE COMPLETING TASK IN BENT POSITION	No	179	44.2
	Yes	226	55.8
INVOLVE TWISTING HOLDING YOU TRUNK	No	195	48.1
	Yes	210	55.8
CARRYING HEAVY OBJECTS DAILY	No	241	59.5
	Yes	164	40.5
LIFTING AND PLACING OBJECTS	No	236	58.3
	Yes	169	41.7
SAME POSITION FOR LONG PERIOD	No	199	49.1
	Yes	206	50.9
HANDS ABOVE	No	174	43

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http://amresearchreview.com/index.php/Journal/about

SHOULDER LEVEL	Yes	231	57
WORK WITH VIBRATION TOOL	No	202	49.9
	Yes	203	50.1
DAILY ACTIVITIES IN HOT ENVIRONMENT	No	215	53.1
	Yes	190	46.9
TASK IN COLD ENVIRONMENT	No	218	53.8
	Yes	161	46.2
CLOTHES BECOMING WET COMLETING WORK	No	244	60.2
	Yes	161	39.8

INFERENTIAL STATISTICS:

Table: Pearson correlation of NMQ variables with DMS Variable

VARIABLES		X2 VALUE	PVALUE
neck discomfort 12m	ORF5	20.225	0.048
shoulder discomfort 12 m	ERF8	29.227	0.001
elbow discomfort 12m	ERF6	9.811a	0.02
wrist discomfort 12m	ERF6	16.67	0.001
upper back discomfort 12m	ERF3	24.027a	0.001
lower back 12m	ERF6	.034a	0.855
lower back 12m	ERF7	1.745a	0.186
thigh discomfort 12m	ERF3	6.133a	.013
knee discomfort 12m	ERF2	4.577a	0.32
ankle discomfort 12m	ERF2	5.113a	0.024
knee discomfort limited	ORF3	.022a	0.882
shoulder discomfort in 7days	ORF7	1.276a	0.259
thigh discomfort at 7days	ORF9	6.746a	0.009
upper back limited	ORF6	.494a	0.482
knee discomfort limited	ORF5	2.011a	0.156
ankle discomfort at 7days	ORF2	4.301a	0.038
knee discomfort limited	ORF3	.022a	0.882
neck discomfort limited in 12m	ORF4	2.405a	0.121
elbow discomfort at 7days	ORF7	.110a	0.74

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Online ISSN 3007-3197
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http://amresearchreview.com/index.php/Journal/about

lower back limited	ORF5	.071a	0.79
elbow discomfort limited	ERF6	3.024	0.082
Wrist discomfort limited	Erf 5	1.920	.166
Thigh discomfort limited	ERF 1	27.257	.000
ankle discomfort limited	ORF6	0.800	0.777

DISCUSSION

This study explored the impact of occupational stress on musculoskeletal disorders (MSDs) among office workers in Sialkot, using a sample of 405 participants. The findings highlight a significant prevalence of musculoskeletal discomfort, with the wrist, neck, upper back, lower back, knee, thigh and ankle being the most commonly affected regions. Symptoms were reported both in the short term (7-day recall) and long term (12-month recall) demonstrating that occupational stressors exert both immediate and cumulative effects on musculoskeletal health.

Our findings are in agreement with a large body of literature linking occupational stress with musculoskeletal disorders. Varghese reported that individuals with a higher body mass index (BMI) working in computer-intensive jobs experienced greater musculoskeletal discomfort and higher occupational stress scores. This parallels our findings, as participants with longer working hours and sedentary postures reported more frequent discomfort, particularly in the wrist, upper back, and lower limbs, suggesting that biomechanical load combined with psychosocial stress amplifies MSD risk (18).

Similarly Bonzini demonstrated that job stress was associated with higher prevalence of neck and back pain among Italian nurses, emphasizing the bidirectional relationship between stress and pain can increase stress, and stress can lower pain tolerance. Our results corroborate this, as participants reporting higher stress exposure also reported more persistent pain over 12 months particularly in the upper back and knee, indicating chronicity (19).

Our findings on upper back discomfort align with **(20).** who showed that prolonged computer work and awkward postures predict upper back and shoulder pain at 12 months. In our study, the upper back showed significant discomfort over both short- and long-term periods, reinforcing the role of poor posture, static sitting, and workstation design in symptom persistence **(20).**

The association between wrist pain and occupational exposure in our study supports evidence from **(21).** who reported that prolonged repetitive hand use significantly increases the risk of carpal tunnel syndrome and chronic wrist disorders. This strengthens the argument that preventive strategies must focus on reducing repetitive strain through ergonomic adjustments and work-rest cycles **(21).**

Regarding knee and thigh discomfort, our findings agree with Herquelot who concluded that occupations involving repetitive squatting or kneeling predispose workers to chronic knee pain and soft tissue overuse injuries. Although our sample consisted of office workers, many reported prolonged sitting with limited mobility, which is known to increase lower-limb stiffness and discomfort, possibly due to impaired blood circulation and muscle shortening (22).

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Print ISSN 3007-3189
http://amresearchreview.com/index.php/Journal/about

Interestingly, some results were non-significant, such as the association between neck discomfort and certain occupational risk factors. This aligns with findings salo author who observed that physical risk factors alone have weak predictive power for neck pain development, suggesting that psychosocial factors (job satisfaction, stress perception) may be stronger predictors of chronic neck symptoms (23).

The results of this study have several practical implications for workplace health management. First, they reinforce the need for **integrated ergonomic and psychosocial interventions,** Ariens show as MSDs are multifactorial and influenced by both physical and mental stressors. Providing employees with height-adjustable chairs and desks, proper keyboard/mouse placement, and encouraging frequent micro-breaks may reduce mechanical loading **(20).** Moreover, implementing **stress management programs** such as mindfulness training, workload redistribution and supervisor support could help mitigate the psychosocial burden, potentially breaking the cycle between stress and pain. This is consistent with recommendations by Alammari who emphasized addressing both physical and psychological stressors to improve workforce health outcomes.

The cross-sectional study design limits the ability to establish a cause-and-effect relationship between occupational stress and musculoskeletal disorders, variations in work environment, job roles and organizational culture were not standardize, which might have influenced participants' stress levels, confounding variables such as physical activity, workstation ergonomics, BMI and lifestyle factors were not fully controlled, the study was restricted to a specific geographic area and limited to office workers, reducing the generalizability of results to other populations and the absence of longitudinal follow-up prevents evaluation of long-term effects of occupational stress on musculoskeletal health.

Future research should use a prospective cohort design to establish causal links between occupational stress and MSDs, test the effectiveness of ergonomic modifications and stress-reduction programs on reducing MSD prevalence, combining physical workload measurements with psychosocial assessments would provide a more holistic understanding of MSD development and explore gender differences job roles and work experience to identify high-risk groups.

CONCLUSION

This study concludes that occupational stress has a significant impact on the prevalence and persistence of musculoskeletal disorders (MSDs) among office workers. Many participants reported that discomfort in the wrist, neck, upper back, lower back, thighs, knees and ankles was frequently reported with a higher prevalence observed over the 12-month recall period compared to the 7-day recall. The continuous stress at work, along with long sitting hours and poor posture can turn short-term pain into long-lasting problems. These complaints were more common when looking at symptoms over a whole year compared to just one week. This indicates that prolonged exposure to occupational stressors and work-related postures contribute to the development of chronic musculoskeletal problems.

REFERENCES

Online ISSN 3007-3197
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http://amresearchreview.com/index.php/Journal/about

Agarwal S, Amromin G, Chomsisengphet S, Landvoigt T, Piskorski T, Seru A, et al. Mortgage refinancing, consumer spending, and competition: Evidence from the home affordable refinance program. The Review of Economic Studies. 2023;90(2):499-537.

Bassey EJ, Fiatarone MA, O'neill EF, Kelly M, Evans WJ, Lipsitz LA. Leg extensor power and functional performance in very old men and women. Clinical science (London, England: 1979). 1992;82(3):321-7.

Avlund K, Schroll M, Davidsen M, Løvborg B, Rantanen T. Maximal isometric muscle strength and functional ability in daily activities among 75-year-old men and women. Scandinavian journal of medicine & science in sports. 1994;4(1):32-40.

Crawford JO, Berkovic D, Erwin J, Copsey SM, Davis A, Giagloglou E, et al. Musculoskeletal health in the workplace. Best practice & research clinical rheumatology. 2020;34(5):101558.

Lamb S, Kwok KC. A longitudinal investigation of work environment stressors on the performance and wellbeing of office workers. Applied ergonomics. 2016;52:104-11.

Omar AZ, Demong NAR. Designing the Contentment: Investigating the Effects of Office Environment and Physical Design on Employee Satisfaction. Advances in Business Research International Journal. 2023;9(1):19-34.

Nixon AE, Mazzola JJ, Bauer J, Krueger JR, Spector PE. Can work make you sick? A meta-analysis of the relationships between job stressors and physical symptoms. Work & Stress. 2011;25(1):1-22.

Wan M, Huda B. Prevalence and associated factors of repetitive strain injury of upper extremities among office workers in a government agency, putrajaya. International Journal of Public Health and Clinical Sciences. 2016;3(6):65-79.

Jimmieson NL, Bergin AJ, Bordia P, Tucker MK. Supervisor strategies and resources needed for managing employee stress: A qualitative analysis. Safety science. 2021;136:105149.

Erwin J. Musculoskeletal health in the workplace. Best Practice & Research Clinical Rheumatology. 2020.

Lewis R, Gómez Álvarez CB, Rayman M, Lanham-New S, Woolf A, Mobasheri A. Strategies for optimising musculoskeletal health in the 21st century. BMC musculoskeletal disorders. 2019;20(1):164.

Beaudart C, Dawson A, Shaw S, Harvey NC, Kanis J, Binkley N, et al. Nutrition and physical activity in the prevention and treatment of sarcopenia: systematic review. Osteoporosis International. 2017;28:1817-33.

Sethi J, Sandhu JS, Imbanathan V. Effect of Body Mass Index on work related musculoskeletal discomfort and occupational stress of computer workers in a developed ergonomic setup. Sports Medicine, Arthroscopy, Rehabilitation, Therapy & Technology. 2011;3(1):22.

Yirdaw AT, Kinfe B, Belay AA, Bezie AE, Natnael T. Work-related musculoskeletal disorders and associated factors among workers in Kombolcha Textile Industry, Northeast Ethiopia. Scientific Reports. 2025;15(1):26260.

Kuorinka I, Jonsson B, Kilbom A, Vinterberg H, Biering-Sørensen F, Andersson G, et al. Standardised Nordic questionnaires for the analysis of musculoskeletal

Online ISSN 3007-3197
Print ISSN 3007-3189

symptoms. Applied ergonomics. 1987;18(3):233-7.

Chomitz VR, Slining MM, McGowan RJ, Mitchell SE, Dawson GF, Hacker KA. Is there a relationship between physical fitness and academic achievement? Positive results from public school children in the northeastern United States. Journal of School Health. 2009;79(1):30-7.

Polit DF, Beck CT. The content validity index: are you sure you know what's being reported? Critique and recommendations. Research in nursing & health. 2006;29(5):489-97.

Varghese MM. A study to assess the knowledge regarding repetitive strain injuries among computer professionals in selected companies, Bangalore with a view to develop an information booklet: Rajiv Gandhi University of Health Sciences (India); 2012.

Bonzini M, Bertu' L, Veronesi G, Conti M, Coggon D, Ferrario MM. Is musculoskeletal pain a consequence or a cause of occupational stress? A longitudinal study. International archives of occupational and environmental health. 2015;88(5):607-12.

Ariëns G, Bongers P, Douwes M, Miedema M, Hoogendoorn W, van der Wal G, et al. Are neck flexion, neck rotation, and sitting at work risk factors for neck pain? Results of a prospective cohort study. Occupational and environmental medicine. 2001;58(3):200-7.

Van Rijn RM, Huisstede BM, Koes BW, Burdorf A. Associations between work-related factors and the carpal tunnel syndrome—a systematic review. Scandinavian journal of work, environment & health. 2009:19-36.

Herquelot E, Bodin J, Roquelaure Y, Ha C, Leclerc A, Goldberg M, et al. Work-related risk factors for lateral epicondylitis and other cause of elbow pain in the working population. American journal of industrial medicine. 2013;56(4):400-9.

Salo L, Hyvärinen A, Jalava P, Teinilä K, Hooda RK, Datta A, et al. The characteristics and size of lung-depositing particles vary significantly between high and low pollution traffic environments. Atmospheric Environment. 2021;255:118421.