ORIGINAL ARTICLE

The association of prolonged sitting with musculoskeletal discomfort among office workers of Peshawar, Pakistan: A Cross-sectional study

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ABSTRACT

Background: Excessive sitting behavior is a potential hazard for a large number of adverse health outcomes. The increasing trend toward computer-based work has led to substantial sedentary time in workplace settings, especially within the office environment. Prolonged sitting at work is recognized to have a detrimental impact on health in general. However, its precise repercussions on the musculoskeletal system are unclear. This study sought to determine the prevalence of musculoskeletal discomfort in this population and to find its relationship with prolonged sitting.

Methodology: A cross-sectional design was employed, enrolling n = 200 office workers, aged 18-60 years, and with at least a year of experience using a convenience sampling. Data collection utilized the Nordic Musculoskeletal Questionnaire, and Pain intensity was assessed using the NPRS. Associations among variables were analyzed using the chi-square test.

Results: The mean age of participants was 34.83 ± 8.22 years, and they spent an average of 6.10 ± 1.39 hours per day seated. Overall, 88% of people reported having musculoskeletal discomfort, with the lower back being the most common site (64%). Extended sitting duration was significantly associated with musculoskeletal discomfort in the cervical (P = 0.041), elbows (P = 0.045), and wrist/hands (P = 0.002). Additionally, a significant association emerged between musculoskeletal discomfort and both gender (P = 0.023) & exercise routine (P < 0.001).

Conclusion: Prolonged sitting adversely impacts the musculoskeletal system among office workers. An active working environment & short breaks during working hours are therefore recommended to reduce sitting time and ultimately the health hazard.

Keywords: Musculoskeletal discomfort, Office-workers, Prolonged sitting, Work–related musculoskeletal symptoms, sedentary lifestyle, Occupational Health, workplace, Low back pain

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INTRODUCTION

Excessive sitting behavior is a potential hazard for a large number of adverse health outcomes (1). The increasing trend toward computer-based work has led to substantial sedentary time in workplace settings, especially within the office environment (2). Prolonged sitting at work is recognized to have a detrimental impact on health in general. However, its precise repercussions on the musculoskeletal system are unclear (3). The Centre for Disease Control and Prevention defines Musculoskeletal Disorders (MSDs) as “injuries affecting muscles, tendons, nerves, joints, cartilage, and spinal discs, due to a wide range of inflammatory and degenerative conditions” (4). Musculoskeletal symptoms such as pain, tingling, numbness, fatigue, stiffness, swelling, redness, and weakness, commonly referred as musculoskeletal discomfort, typically characterize these disorders (5). Office workers are more likely to acquire MSDs due to extended sitting, uncomfortable sitting position, the physically and mentally demanding nature of the work, the repetitive task they perform in front of computers, and insufficient rest or recovery time during long working hours (5, 6). At the same time, the occurrence of low back pain and other musculoskeletal complaints has also increased among them in general (7). The development of musculoskeletal complaints is known to be influenced by a number of occupational hazards - physical, psychological, and institutional factors (8). According to the research, office employees spend roughly two third of their working time seated, and their sitting sessions usually continue for at least thirty minutes (1, 9). an Australian study revealed that office workers were spending an average 6.3 hours of their 8 hours shifts in a sitting posture (10). Similarly, another study found that people spend about 50% to 86% of their working hours undertaking sedentary work,

depending on occupation (11). Although while in a seated position muscles, bones, and joints are minimally loaded, still musculoskeletal complaints remain the most prominent among office workers and others who sit for lengthy periods of time (11). The distribution of musculoskeletal discomfort across different body regions varies by occupation. Neck (53.5%), lower back (53.2%), and shoulder (51.6%) symptoms are the most frequently documented complaints by the office crew (1). Gianoudis et al. (2014) observed that each one-hour increase in overall sitting time increases the risk of developing sarcopenia by 33%, thereby leading to MSD (7).

Previous studies have revealed that musculoskeletal problems in the neck, upper limb, shoulders, and low back are common among office workers (12). According to reports, its prevalence generally ranges from 40 to 80% (13). This high prevalence can be accredited to multiple causative factors including prolonged sitting, awkward & static posture, repetitive movements as well as poor ergonomics of working environment etc. (1). Although the contribution of these risk factors in developing MSDs has been explored by many researchers so far, the association of prolonged sitting with MSDs has not yet been clearly justified. There are numerous studies about the impact of prolonged sitting behavior on the general well-being of office workers, (1, 11) However, to the best of our knowledge, fairly few of these studies have assessed its impact purely on the locomotor system. Therefore, this study aimed to figure out how common extended sitting is among office workers and what effect it ultimately has on their musculoskeletal health.

Numerous studies have investigated the bad consequences of sedentary behavior and prolonged sitting on the general health as well as on the musculoskeletal system of office personnel. These studies have traditionally focused on the prevalence of different medical and musculoskeletal conditions among office working people and their etiological factors in the office environment. Similarly, neck, upper limb and back pain among office personnel have been addressed more thoroughly, however, the evidence of association is inconsistent. Consequently, the current literature is inadequate to establish an association between prolonged sitting and MSD. Therefore, to address this gap the current study aimed to assess the prevalence of MSD across all body regions of office workers and more specially, to determine whether such discomfort correlates with prolonged sitting behavior.

MATERIAL AND METHODS

This analytical cross-sectional study was carried out over six months following approval from the Graduate Committee and ASRB of KMU, Peshawar. Data were collected from office workers at Khyber Medical University and public/private banks in Hayatabad Phase-5, Peshawar. A sample size of 200 was calculated using the Raosoft calculator (95% confidence level, 5% margin of error), and participants were recruited via non-probability convenience sampling. Office workers aged 18–60 years with at least one year of service were included; individuals unwilling to participate or with recent trauma, congenital deformities, or diagnosed rheumatic conditions were excluded. After obtaining institutional permissions and informed consent, eligible participants were requested to complete a questionnaire consisting of two parts: demographic information and the general Nordic Musculoskeletal Questionnaire (NMQ) for assessing musculoskeletal disorders (MSDs). Pain intensity was evaluated using the Numeric Pain Rating Scale (NPRS). Data were analyzed using SPSS version 25.0, using means and standard deviations for quantitative variables, and frequencies with percentages for categorical variables. Chi-square tests assessed associations between MSDs and factors such as sitting duration, demographics, and workplace characteristics.

RESULTS

The study included 200 participants with minimum one year of professional experience were involved in the study, out of which n=110, (55%) were employees of Khyber Medical University and n = 90, (45%) were the employees of the public and private sector banks. Based on gender large majority of the participants were male n = 168, (84%) while n = 32, (16%) were females. The mean age was 34.83 ±8.22 years, ranging from 20 to 58 years old. Detailed descriptions of the demographic characteristics of the participants are given in table 1.

JOB EXPERIENCE & PARTICIPANTS' SITTING BEHAVIOR

Participants involved in this study were mostly office clerks/accountants/bank cashiers (27%), administrative workers (24%), IT workers (13%), banking administrators and assistants, etc. The length of their working shift ranged from 5to 12 hours each day, with a mean working duration of

8.09 ± 1.02 hours/day. Furthermore, the respondents spent an average of 6.10 ± 1.39 hours of 08 hours working shift in a sitting position, which is about 76.25% of their working hours (table 2).

BODY-PERCEIVED MUSCULOSKELETAL DISCOMFORT

Table 3 shows the frequency of reported musculoskeletal discomfort in different body regions of white-collar employees during the last 12 months of working in a sitting position for a prolonged time. The respondents having MSD during the last 12 months rate the intensity of their discomfort as mild (43%) and moderate pain (41.5%) on the Numeric Pain Rating Scale (Fig.1).

ASSOCIATION OF PROLONGED SITTING WITH MUSCULOSKELETAL DISCOMFORT

The chi-square test was employed to evaluate the association of perceived MSD in different body regions with prolonged sitting and different other variables. The analysis of sitting duration against MSD in any body region during the last 12 months indicated a statistically non-significant correlation between the two, as the P-value was 0.862, which is greater than the critical value (0.05). Neck pain & stiffness was the second most common MSD among office workers. Musculoskeletal discomfort of the neck was significantly associated with participants sitting hours/day (P = 0.041) and occurred most often in individuals sitting for 5-7 hours per day. Similarly, MSD in the elbows and wrists/Hands were also significantly associated with sitting duration, with P-values of 0.045 & 0.002 respectively. However, the results of the rest of the body regions for association were not statistically significant as their P-values were greater than 0.005, hence no statistically significant associations were found (table 4).

ASSOCIATION OF MSD WITH THE DEMOGRAPHIC AND WORKPLACE CHARACTERISTICS OF THE PARTICIPANTS

Table 5 shows the association of MSD with various demographic and working place dynamics of the participants. Findings of this study demonstrated that overall musculoskeletal discomfort across different body regions was more prevalent in females (100%), compared to males (85.7%). MSD in different body regions was strongly associated with the gender of the participants (P = 0.023). Another very strong significant association of MSD was found with the exercise routine for which the P-value was (P < 0.001), indicating a significant association between the two variables. It is clear from table 5 that the percentage of MSD is high in participants with no exercise routine, followed by those who exercise twice a week. The results of the rest of the variables for association with MSD were statistically non-significant, hence no association was found (Table 5).

Table 1: demographics characteristic

Variable		Frequency	Percentage
Gender of the participant	Male	168	84.00%
	Female	32	16.00%
Age of the participant (years)	20 to 29 years	58	29.00%
	30 to 39 years	83	41.50%
	40 to 49 years	47	23.50%
	50 to 60 years	12	6.00%
Name of the institution /department /organization	KMU	110	55.00%
	UBL	19	9.50%
	MCB	27	13.50%
	NBP	7	3.50%
	HBL	3	1.50%
	BOK	15	7.50%
	ABL	19	9.50%
Job-status/Position	Director	10	5.00%
	Administrative work	48	24.00%
	Academic/ Research work	26	13.00%
	IT work	26	13.00%
	Office clerk/ Accountant/ Bank cashier	54	27.00%
	Bank manager	8	4.00%
	Banking Administrator	15	7.50%
	Banking Assistant	13	6.50%

Table 2 Frequency of working hours per day and time spent in a sitting position per working day.

Variable		Frequency	Percentage
Working hours per day categorical	4 to 6 hours	14	7.00%
	7 to 9 hours	170	85.00%
	10 to 12 hours	16	8.00%
sitting hours per day categorical	2 to 4 hours	23	11.50%
	5 to 7 hours	147	73.50%
	8 to 10 hours	30	15.00%

Table 3:Frequency & percentage of reported musculoskeletal discomfort in different body regions during the last 12 months & the last 7 days.

	Body region	Number of participants with MSK symptoms	Percentage %
Musculoskeletal Discomfort Reported during the last 12 months	Neck	101	50.50%
	Shoulders	58	29.00%
	Upper back	56	28.00%
	Elbow	21	10.50%
	Wrists/Hands	46	23%
	Lower back	128	64%
	Hips/Thighs	24	12%
	Knees	51	25.50%
	Ankle/Feet	27	13.50%
Musculoskeletal Discomfort Reported during The last 12 months	Neck	47	23.50%
	Shoulders	28	14%
	Upper back	29	14.50%
	Elbow	10	5%
	Wrists/Hands	22	11%
	Lower back	70	35%
	Hips/Thighs	13	6.50%
	Knees	22	11%
	Ankle/Feet	11	5.50%

Table 4: Association of MSD and its intensity with the sitting duration/day of the participants

Body region		Sitting duration per day			Chi-square test P-value
		2 to 4 hours	5 to 7 hours	8 to 10 hours	
Musculoskeletal discomfort in any body part during the last 12 months?	Yes	21	129	26	0.862
	No	2	18	4	
Neck	Yes	6	80	15	0.041
	No	17	67	15	
Shoulders	Yes	4	44	10	0.398
	No	19	103	20	
Upper Back	Yes	5	39	12	0.253
	No	18	108	18	
Elbows	Yes	2	12	7	0.045
	No	21	135	23	
Wrists/Hands	Yes	2	30	14	0.002
	No	21	117	16	
Lower Back	Yes	15	93	20	0.932
	No	8	54	10	

Hips/Thighs	Yes	3	17	4	0.951
	No	20	130	26	
Knees	Yes	5	39	7	0.849
	No	18	108	23	
Ankles/Feet	Yes	5	17	5	0.356
	No	18	130	25	
Sitting hours per day * Intensity of the pain (NPRS) Cross tabulation					
The intensity of pain (NPRS)	No pain	2	18	4	0.019
	Mild pain	15	61	10	
	Moderate	6	65	12	
	Severe	0	3	4	

Table 1: Association of MSD with various demographic & workplace characteristics of the participants

Variable	Categories	Musculoskeletal discomfort during the last 12 months		P-value
		Yes	No	
Gander	Male	144	24	0.023
	Female	32	0	
Age	20 to 29	50	8	0.530
	30 to 39	71	12	
	40 to 49	44	3	
	50 to 60	11	1	
Institution/ Organization	KMU	95	15	0.431
	Banks	81	9	
Job-status/position	Director	10	0	0.278
	Administrative work	40	8	
	Academic /research work	23	3	
	IT work	22	4	
	Office clerk/Accountant/ cashier	45	9	
	Bank manager	8	0	
	Banking Administrator	15	0	
	Banking Assistant	13	0	
Job tenure	1 to 5 years	62	10	0.449
	6 to 10 years	58	10	
	11 to 15 years	35	4	
	16 to 20 years	10	0	
	More than 20 years	11	0	
Exercise routine	Daily	27	12	<0.001
	Twice a week	42	5	
	3-5 days/week	29	4	
	None	78	3	

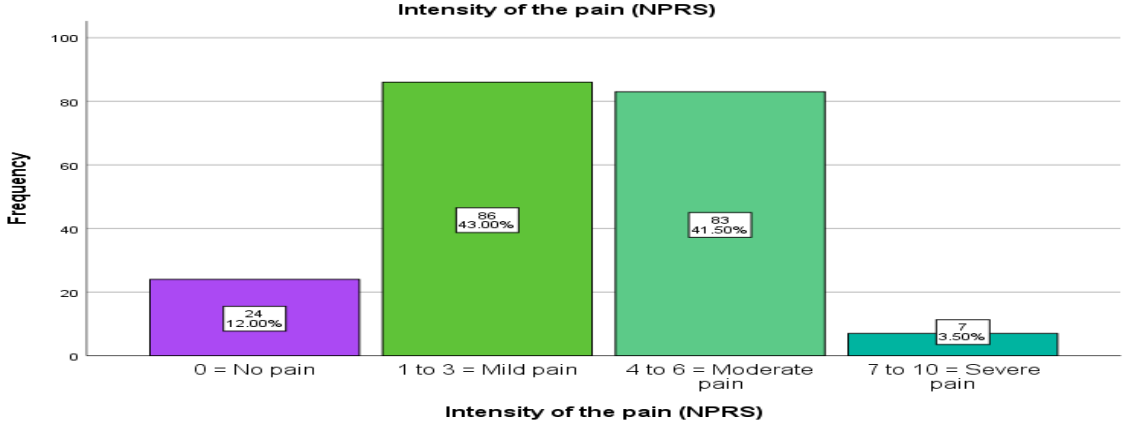

Figure 1: Intensity of discomfort perceived by the respondents

DISCUSSION

The present study explored the prevalence of MSD among office workers and analyzed its relationship with their prolonged sitting habits in the office. According to NMQ findings, musculoskeletal discomfort was highly prevalent in the lower back (64%), neck (50.5%), shoulders (29%), and upper back (28%). These results align with earlier studies that have also indicated lower back, neck and shoulders pain as the most prevalent MSD among office workers (14-16). Likewise, the overall MSD prevalence in office workers was in the range of 25.9% to 90 %, and region wise the prevalence of neck was in the range of 40% to 69%, lower back 36% to 66.7%, shoulders 35 to 73%, knees 41.8% to 67.1 in the previous studies(16-20). This wide variation across the studies could be due to the difference in occupational settings and/or criteria for symptom assessment.

The results of our statistical analysis revealed that MSD in the neck ($P = 0.041$), elbows ($p = 0.045$), and wrist/hands ($p = 0.002$) was significantly associated with the sitting duration of office workers. No significant association emerged between the sitting time of the participants and MSD in the rest of the body regions ($P > 0.05$). Furthermore, the association of sitting duration with the overall MSD in any body region during the last 12 months was also statistically non-significant ($p = 0.862$).

In contrast to this, the findings of a study conducted by Hadi Daneshmandi et demonstrated that there is a significant association between prolonged sitting and MSD in the shoulders, lower back, hips, and knees of office workers (1, 21). Similarly, many other previous studies have reported that overall sitting time at the office, both during working hours and in free time, has an impact on neck-shoulder integrity, and that office workers are more vulnerable to experience neck-shoulder symptoms as a result of prolonged sitting (22). The findings demonstrated that individuals with moderate sitting time had less severe neck and shoulder pain, whereas those with high intensity shoulder pain had significantly greater sitting time overall (22). The studies of Carolin Bontrup et. al, Fahad Hanna et al., and Jennifer L.Garza et al., respectively also reported a statistically significant association of prolonged sitting with musculoskeletal discomfort in the upper back, lower back, and legs/feet among office workers (7, 15, 23, 24). These discrepancies might be attributed to the multifactorial nature of musculoskeletal disorders among office workers including prolonged sitting, repetitive movements, poor ergonomics of work sitting and other physical and psychological factors.

Although our result did not show a statistically significant association between MSD and prolonged sitting, the prevalence of MSD was higher in individuals whose sitting duration per day was high. The current study also demonstrated a significant relationship ($P = 0.019$) between sitting duration & intensity of MSD, indicating a relationship between the two. In accordance with the result of current, previous studies also reported that perceived MSD in all body regions increases in intensity as well as in prevalence during a long sitting period.

According to chi-square analysis, the current study also showed a statistically significant association of MSD with gender ($P = 0.023$) & exercise routine ($P < 0.001$) of the participants.

CONCLUSION

This study concluded that musculoskeletal discomfort in the neck, elbows, and wrists/hands reported by office employees over the previous 12 months was significantly associated with their prolonged sitting behavior. However, MSD in the rest of the body regions were not significantly associated with their sitting duration per day. The frequency of musculoskeletal discomfort was very high among office workers, with lower back, neck, shoulders and upper back pain being the most prevalent problems reported during the last 12 months. Moreover, MSD among office workers was strongly associated with their gender and exercise routine, which shows that a sedentary office environment further increases the risk of acquiring musculoskeletal disorders. In short, the observed results suggest that sitting for too long may have consequences for musculoskeletal discomfort. An active working environment & short breaks during working hours are therefore recommended to reduce occupational sitting time.

LIMITATIONS AND RECOMMENDATIONS

We acknowledge various limitations in the study. Although a valid questionnaire was employed to minimize such errors, recall or response bias may still exist because the data were self-reported. Additionally, we cannot completely rule out the impact of unmeasured confounding variables that could have influenced the observed relationships, such as poor workstation ergonomics, repetitive movements, or incorrect sitting posture. Generalizability is limited since our sample was limited to office workers at Khyber Medical University and a few banks in Peshawar. Future controlled studies with objective sitting time

measurements and diverse samples are recommended.

CONFLICT OF INTEREST

This was a self-funded study and the authors have no conflict of interest to report.

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