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Impact of Prolonged Computer Use on Upper Extremity Pain and Disability among Medical Coders in Twin Cities of Pakistan

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Author`s Contribution

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ABSTRACT

Background: With the increasing reliance on computers, prolonged usage has become a common occupational factor associated with musculoskeletal symptoms, especially among medical coders. Studies have shown that static postures and repetitive upper limb movements contribute to upper extremity (UE) pain and disability. However, there is limited research focusing on this professional group in Pakistan.

Objective: This study aimed to assess the frequency of upper extremity symptoms and investigate associated demographic and occupational factors among medical coders in Islamabad and Rawalpindi.

Methodology: A cross-sectional, questionnaire-based survey was conducted with 191 medical coders (age 20-35 years; 56.5% males, 43.5% females) using the Quick Disabilities of the Arm, Shoulder, and Hand (Quick DASH) outcome measure and Visual Analog Scale (VAS) for pain. Participants provided demographic information, and data were analyzed using descriptive statistics and linear regression.

Results: Among participants, 50% reported mild to severe UE disability, while 59.7% reported varying levels of pain, as indicated by Quick DASH and VAS scores. Factors such as age, gender, working hours, shift type, and experience were positively associated with increased UE pain and disability. Evening shift workers and those with longer working hours reported higher symptom severity.

Conclusion: Upper extremity pain and disability are prevalent among medical coders, with occupational factors significantly affecting their daily activities and quality of life. These findings underscore the need for ergonomic interventions and workload management to mitigate symptoms and enhance the well-being of medical coders.

Keywords: Quick DASH questionnaire, VAS scale, upper limb disability, upper extremity symptoms, medical coders, computer users.

Introduction

A medical coder's day begins with a computer. Medical coders' duties are made more precise by computers and other technical advancements. Medical coders spend an average of 39.5 hours per week, or about 8 hours per day, according to a poll by American Academy of Professional Coders (AAPC). However, computer usage for longer than 6

hours is likely to develop various upper extremity symptoms.[1] It is not uncommon for workers engaged in static work or tasks that require repetitive motion of their upper limbs and prolonged computer use to experience upper extremity symptoms.[2] The more hours spent typing, the greater the chance of developing a shoulder hand- or wrist-related musculoskeletal symptoms.[3] Muscular force and length characteristics are determined by work needs, which in turn affects muscle needs for energy which ultimately may cause fatigue and result in painful activities.[4] Deformation of the muscle's tissues, as well as an increase in intramuscular tissue due to fatigue may impact the blood supply to the muscles.[5] If intramuscular pressure is retained high for an extended period of time, such as while performing sustained isometric contractions, the blood flow can decrease.[6] These changes are typical signs of muscle inflammation, but they can be reversed if the muscles are given time to rest and recover and regeneration of connective tissue occurs. However, if the job causes damage every day, the muscle's ability to repair the damage efficiently may be compromised which may result in permanent disability.[7] Upper extremity symptoms include a variety of manifestations, including not only muscular complaints but also well-known medical disorders of the tendon, neuron, muscle, joint, vascular, and bursa. The symptoms, which can lead to limitations in activities, may include pain, inflammation, rigidity, numbness, tingling sensations instability, diminished strength, paresthesia, edema, and restricted range of motion.[8] Upper extremity symptoms are frequently noticed and are more common now due to the swift advancement of information technology and the widespread use of computers, whether at work or at home.[9] There are approximately 31% more upper extremity symptoms among office workers who are secretaries and typists than there are in all other administrative fields.[10, 25] There is a minimal number of research available on upper extremity symptoms in medical coders and most of the studies on the subject are generalized on computer users and there is hardly any study on this population at all in Pakistan.[11] To find the precise rationale behind the symptoms we tried to study more than one factor which could cause the symptoms. Being physiotherapists, we felt the need to specify computer users from general population to a more individualized one as recent technological advancements can bring much more to the field (of computer users) which might result in more specific symptoms specific to their jobs.[12, 26] The current study was conducted to find out the effects of prolonged computer usage on the upper extremity, absence of severe or chronic medical conditions and level of disability and pain in UE among medical coders. This study has included demographics, VAS scale and Quick DASH scale to not only have determined the prevalence of symptoms but also highlighted some factors that contributed as major etiology.

Methodology

A cross-sectional descriptive study was conducted among medical coders in Islamabad and Rawalpindi for 6 months (July – December 2023) after the approval of synopsis. The sample of 191 medical coders was taken by using non-probability convenient sampling technique. Both male and female medical coders aged between 20-35 years working at least 6 hours per day were included in the study. Medical coders with any underlying pathology or deformity related to upper extremity or the pregnant females and medical coders who went through any surgical procedure were excluded from this study. Self- reported Questionnaires were distributed among medical coders selected based on exclusion and inclusion criteria. [13] Research permission was taken from the ethical research committee of SZAMBU and BIHS with ECCR Ref no. BI-112/DPT-2023 to conduct the study. The mandatory permission letter was taken from the medical coding and billing companies for the approval of the participation of medical coders working there in the study. The data collected from participants was kept coded and confidential. No potential psychological, physical and emotional harm was done to the participants. The collected data was analyzed on SPSS version 26. Data collection instruments were demographics, Quick DASH Questionnaire and VAS scale. The descriptive statistics, including frequency distribution, means, and standard deviations were calculated. Furthermore, linear regression analysis was performed to identify the association of the socio-demographic factors and potential risk factors (independent variables) with the Quick DASH total score and VAS score (dependent variables).[14]

Results

Medical coders who participated in this study were between 20 to 35 years of age. Both genders were included with 56.5% males and 43.5% females. The Table-1 showed the frequencies of the respondents with different working experience, i.e. less than 6 months were 55% and 6-12 months 45%. It also showed the frequency of coders working in different shifts included in our study i.e. 52% in morning shift and 48% in evening shift and frequency of medical coders working for different amounts of time per day included in our study i.e. 6-8 hours 60% and 8-10 hours 40%.

The overall Quick DASH score showed a different level of disability among medical coders i.e. no disability (49.74%), mild disability (32.98%), moderate disability (13.61%) and severe disability (3.66%). It was interpreted as 0-9 (no disability), 10-29 (mild disability), 30-49 moderate disability and 50-100 severe disability (Table-2). By using the Quick DASH scale, the Interference of UE problems in daily activities was also found among the medical coders. 58.6% (no interference), 25.1% (slightly), 13.1% (moderately), 2.6% quite a bit and 0.5% showed extreme interference. Some Limitations in work or daily activities due to UE problems was also found in medical coders i.e. 61.3%, 24.6%, 11%, 1.6% showed not at all, slightly limited, moderately limited, very limited and unable, respectively.

VAS score was used to determine pain felt in the last week in UE. The data shows different levels of pain among the medical coders i.e. 48% (no pain), 77% (mild pain), 51% (moderate pain) and 15% (Severe pain).

Table 4 showed the pain level among the males and female coders. It depicted that more moderate and severe pain in females than in males. The cross tabulation between age and VAS score showed that the pain level for different age groups. The level of moderate and severe disability increased with age. Cross tabulation between working experience and VAS showed pain increased with increasing working experience and cross tabulation between working experience and VAS score showed pain increased with increasing working hours. Cross tabulation between working shift and VAS score showed increased disability in evening shift workers.

The mean Quick DASH total score for the study sample was 15.12 (SD=15.37). The overall prevalence of mild-to-severe upper limb disability in medical coders, based on the original Quick DASH scores, was 50.23%. The mean VAS score for the study sample was 2.75 (SD=2.48). The overall prevalence of mild-to-severe Pain in medical coders, based on the original VAS scores, was 59.69%. The beta value for independent variable Age was 0.136, which means that the change in independent variable by one unit will bring about the change in the dependent variable i.e. Quick DASH score by 0.136. The same expression applies for other independent variables and the β value related to it. The p-value for all independent variables for both the dependent variables was less than 0.05, hence we say that there was a significant relationship between our independent and dependent variables. Furthermore, the beta value for all variables was positive, which indicated the positive relationship between the dependent variable and all independent variable.

Table 1: Frequencies and percentages of various variables

		Frequency	Percent	Cumulative Percent
Gender				
Valid	**Males**	108	56.5	56.5
	Females	83	43.5	100
Age				
Valid	**20-25years**	98	51.3	51.3
	25-30years	78	40.8	92.1
	30-35years	15	7.9	100.0
Working Experience				
Valid	**less than 6 months**	105	55.0	55.0
	6-12 months	86	45.0	100.0
Working Shift				
Valid	Morning	99	51.8	51.8
	Evening	92	48.2	100.0
Working Hours				
Valid	6-8 hours	115	60.2	60.2
	9-10 hours	76	39.8	100.0
	Total	191	100.0	

Table 2: Frequencies and percentages of Quick DASH score

		Frequency	Percent	Cumulative Percent
Quick DASH disability/symptom score				
Valid	No Disability	95	49.7	49.7
	Mild Disability	63	33.0	82.7
	Moderate Disability	26	13.6	96.3
	Severe Disability	7	3.7	100.0
Interference of UE problems in daily activities during past week				
Valid	Not at all	112	58.6	58.6
	Slightly	48	25.1	83.8
	Moderately	25	13.1	96.9
	Quite a bit	5	2.6	99.5
Limitation in work or daily activities due to UE problems during last week				
Valid	Not limited at all	117	61.3	61.3
	Slightly limited	47	24.6	85.9
	Moderately limited	21	11.0	96.9
	Very limited	3	1.6	98.4
	Unable	3	1.6	100.0
VAS score during past week				
Valid	no pain	48	25.1	25.1
	mild pain	77	40.3	65.4
	moderate pain	51	26.7	92.1
	severe pain	15	7.9	100.0
	Total	191	100.0	

Table 3 showed the level of disability among the males and female coders. Out of total 108 males; 67 have no, 29 mild, 11 moderate and 1 have severe disability. It showed the level of disability for different age groups. The level of moderate and severe disability increased with age. Cross tabulation between working experience and Quick DASH showed that the level of disability increased with increasing work experience. Cross tabulation between working shift and Quick DASH score showed increased disability in evening shift workers and cross tabulation between working experience and Quick DASH showed that the level of disability increased with increasing working hours.

Table 3: Quick DASH Score Cross Tabulation among variables

	Quick DASH disability/symptom score				
	No Disability	Mild Disability	Moderate Disability	Severe Disability	Total
Gender					
Males	67	29	11	1	108
Females	28	34	15	6	83
Age					
20-25years	52	36	9	1	98
25-30years	40	25	11	2	78
30-35years	3	2	6	4	15
Working experience					
less than 6 months	72	27	5	1	105
6-12 months	23	36	21	6	86
Working shift					
Morning	62	29	7	1	99
Evening	33	34	19	6	92
Working Hours					
6-8 hours	67	34	13	1	115
more than 8 hours	28	29	13	6	76
Total	95	63	26	7	191

Table 4 Cross tabulation between variables and VAS score in UE

	Pain felt in the last week in UE				
	No pain	**2-3 mild pain**	**4-6 moderate pain**	**7-9 severe pain**	**Total**
Gender					
Males	32	48	25	3	108
Females	16	29	26	12	83
Age					
20-25years	30	41	23	4	98
25-30years	18	31	24	5	78
30-35years	0	5	4	6	15
Working Experience					
less than 6 months	35	43	22	5	105
6-12 months	13	34	29	10	86
Working Hours					
6-8 hours	37	46	26	6	115
more than 8 hours	11	31	25	9	76
Working Shift					
Morning	33	49	13	4	99
Evening	15	28	38	11	92
Total	48	77	51	15	191

Discussion

In this study we determined the prevalence of upper extremity symptoms in 191 medical coders; males and females of age between 20 to 35 years and assessed the association of symptoms with gender, age, working shifts, hours and experience of medical coders. Through using demographic questions in our study for our 191 respondents we divided participants on the basics of gender (males: 56.5% and females:43.5%), age (20-25 age:51.31% ,25-30 age:40.84%, and 30-35 age:7.85%), working experience (less than 6 months: 54.97%, 6 to 12 months:45.03%), working hours (6 to 8hrs: 60.21%, 8to12hrs: 39.79%), and working shifts (morning: 40.31%, evening: 59.69%). We used the disability component of Quick DASH questionnaire which measures self-rated upper extremity disability and symptoms consisting of 11 items related to daily activities and work limitations experienced which consists of three variables.[15] These variables are (A) physical functions; (B) symptoms severity; and (C) social or role function. A cross-sectional study conducted on 773 various Faisalabad, Pakistani computer users concluded that upper extremity pain was far more common in women than in men and also showed the relationship of upper extremity and neck complains with age.[9, 12] This investigation confirmed our findings that there are mild upper extremity symptoms that are more prevalent in females than in males which is about 34% in females and 29% in males. Our study also shows that upper extremity symptoms are dependent on age by using VAS.[16] We discovered that participants between ages 20-25 have 23.5% moderate symptoms and between age 25-30 participants have 30.8% moderate symptoms.[17]

Another study conducted by Almomani et al. among university students in Jordan determined frequencies of upper limb pain and disability among smart phone and computer users and found that it was about 24% prevalent which was related to the years using a digital device and time spent on it. It also has the evidence that age too, does have

an effect on severity of symptoms. According to this study our study also shows the relationship of working experience and working hours with upper extremity symptoms. Furthermore, after conducting this study we found that age affects the severity of symptoms[18] Lastly, we used visual analog scale (VAS) as used in studies conducted in different populations to determine the severity of pain experienced by medical coders which has two termination points 0 (no pain) and 10 (most severe pain/ as bad as it could possibly be).[24, 27]

A study by Basakci Calik, Yagci et al. in School of Physical Therapy and Rehabilitation Kinikli in 2022 and another study conducted by Feng et al. among Chinese office workers revealed that upper extremity symptoms are more prevalent than any other musculoskeletal problem and correlates working hours using computer. [19, 23] In our study by using VAS scale we found medical coders working for 6 to 8 hrs have 40% mild symptoms and 20% severe pain while medical coders working for 8 to 12 hrs have 40.7% mild pain and 32.9% moderate pain. Kaya Aytutuldu, Birinci et al. did a cross sectional study on Turkish computer users in which they describe the association of working years and working hours with pain and musculoskeletal disorders. [20] We also discovered the association of working hours and working experience with UE symptoms. Another study by Bouziri, Smith et al. revealed that there is increased risk associated with work related musculoskeletal pain with short duration of exposure.[21] We also concluded by using quick DASH that morning shift workers have 29.29% mild and 7% moderate pain while evening shift workers have 36.95% mild pain and 20.65% moderate pain. Due to disturbance of circadian rhythm and less exposure to the environment, evening shift workers clearly experience UE symptoms more frequently.[22] Small sample size, less independent variables and observations limited to twin cities (Islamabad and Rawalpindi) can be included as limitations of current study.

Recommendations: This study helped the medical coders, but all the computer users associated with other fields. It helped them and their regulatory committees to regulate their working hours and working shifts with respect to age and gender. It created awareness among the computer users about the difficulty they were facing, or they might face, and to take preventive measures beforehand. Moreover, it was recommended that further research on medical coders should include other variables e.g. ergonomics, breaks times, working environment and other psychosocial factors i.e. means of commute, E.Q., home environment etc. The future researchers can increase the sample size and include other cities from different provinces to generalize the results.

Conclusion

This study concluded that there is a linear relationship between age, gender, working hours, working experience and working shift of the medical coders with the pain and disability in the upper extremity. All these factors affect their ADLs and the quality of life.

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